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Assessing the Impact of Productive Safety Net Program on Asset Building and Sustainable Land Management Practices: A Cross-Sectional Analysis from Eastern Hararghe: Haramaya

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Statement of Declaration

This is to declare that this thesis work entitled “Assessing the Impact of Productive Safety Net Program on Asset Building and Sustainable Land Management Practices: A Cross-Sectional Analysis from Eastern Hararghe: Haramaya” submitted in Partial Fulfillment of the Requirements for the award of the degree of MSc. in Economics (Development Policy Analysis) to the College of Business and Economics, Mekelle University, through the Department of Economics is my authentic work carried out by me. All sources of materials used for this thesis have been duly acknowledged.

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This is to certify that this thesis "Assessing the Impact of Productive Safety Net Program on Asset Building and Sustainable Land Management Practices: A Cross-Sectional Analysis from Eastern Hararghe: Haramaya" submitted in Partial Fulfillment of the Requirements for the award of the degree of MSc. in Economics (Development Policy Analysis) to the College of Business and Economics, Mekelle University, through the Department of Economics, done by Fitsum Aklilu (ID No CBE/PR 009/04) is an authentic work carried out under my guidance. To the best of our knowledge the matter embodied in this thesis work has not been submitted earlier for award of any degree or diploma.

Name of principal advisor: Kidanemariam G.Egziabher (PhD)

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Abstract

The main objective of this study was to assess the impact of productive safety net program (PSNP) on asset accumulation and sustainable land management (SLM) practices in eastern Hararghe, Haramaya district. To this effect primary and secondary data was collected from the rural households of the study area. Both descriptive analysis and econometrics models were used for data analysis. The study has two main impact indicators, i.e, asset holding and sustainable land management. Under asset the livestock asset is converted to the Tropical Livestock Unit (TLU) while the non-livestock assets are measured based on their current market value as reported by the respondents. Under the land management there are two groups: soil conservation (stone and soil bunds, in meter per timad) and fertility improvement practices (chemical and natural fertilizer application, in kg and quintal per timad respectively). Based on the econometrics estimation results selection (participation in the productive safety net programs) was significantly influenced by household demographic characteristics, such as household head gender, family size, number of active female labor, and housing condition and number of food gap months per year experienced by the household. The second stage outcome that is the impact of program participation was found to be positive and significant for both asset formation (livestock, productive and non-productive) and land management (soil and stone bund, and chemical and natural fertilizer). Generally the result indicated that, due to program participation beneficiary households have higher asset size and more involved in land management as compared to non-beneficiary households.

List of Acronyms and Abbreviation

ATT	Average Treatment Effect on the Treated
ATE	Average Treatment Effect
CIA	Conditional Independent Assumption
Das	Development Agents
DS	Direct Support
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Production
HHs	Households
MoARD	Ministry of Agricultural and Rural development
MDGs	Millennium Development Goals
NNM	Nearest Neighbor Matching
OFSP	Other Food Security Program
PSM	Propensity Score Matching
PS	Propensity Score
PW-PSNP	Public Work Productive Safety Net Program
PSNP	Productive Safety Net Program
SLM	Sustainable Land Management
TLU	Tropical livestock Unit
WOARD	Woreda Office of Agricultural and Rural Development

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Chapter one

Introduction

1.1. Background

In all parts of the world the rural poor are vulnerable to both internal and external shocks like natural disasters, seasonal hardship etc. They lack enough resource capabilities to sustain their livelihood which is emanated from limited access to credit and their engagement in low income generating activities. This vulnerability to external shocks and almost negligible capacity to mitigate those shocks forces them to sell their asset and destroy their environment and these reaction pushes them to deeper dimness of poverty (Khaleque et al., undated).Worldwide, Government and Nongovernmental organizations adopts social protection measures that aims to help the poor households to sustain their minimum livelihood, deals with shocks and thus preserve their natural endowments (Ibid).

'Agriculture is the mainstay of Ethiopia's economy, since more than 80% of the country's80 million labor force are farmers,90% of the exports are agricultural commodities and about half of the GDP is generated from this sector (Teshome 2010;cited in Tessema 2011)'.Given this facts economic progress of the country is highly dependent on the performance of the sector.

In Ethiopia, according to the recent information from the ministry of agriculture, despite the recent encouraging works from both the people and government of Ethiopia that resulted in two digit economic growth for the last decade and the resulting substantial reduction in the national poverty figure, the ministry of agriculture recently announced that still over 4 million people are facing the problem of food insecurity.

The poor performance of the agricultural sector, a sector in which the country's economy is hugely relied on, is to be blamed for the immense gap between food demand and food supply which makes many Ethiopians food unsecured. Moreover, as cited in Abebaw, (FAO, 2001) further indicated the fact that the base of Ethiopia's food self sufficiency problem is its poor agricultural productivity. The major bottlenecks of agricultural productivity includes: Adverse changes in climate, along with long term factors (technology, environmental and institutional)

resulted in a diminished land holding, soil degradation and a deteriorated yield per hectare (FDRE, 2001. The decline in land holding has forced in almost no fallow periods and continuous cropping, and by minimizing the efforts to recycle crop residues or other organic matter into the soil have resulted in farmers having to invest in chemical fertilizer to produce enough for their subsistence requirement (FAO, 2001; cited in Abebaw, 2003).

The inability of agriculture to feed the growing population and deterioration of natural resource base forced the country to be food insecure and hence reliant on food aids for the last four decades (Gilligan *et al*., 2008). Ethiopia stands first in terms of getting emergency aid for survival per capita in sub-Saharan African nation, with an average of 700,000 metric tons of food aid per year for the last 15 years (Wiseman, undated).The vast majority of these extraordinarily poor households lives in rural areas that are heavily dependent on rain fed agriculture and thus, in season of poor rainfall, the danger of mass starvation is high (ibid).

Since the tragic 1983-84 famine, the government response to the threat consists of a series of emergency appeals for food aid and other forms of emergency assistance. Although the emergency appeal was successful in saving the life of the starved poor households, it doesn't avoid their exposure to future shocks and deterioration in their asset holdings in time of rainfall fluctuation (Hoddinott et al., 2008). According to (Domelen et al., undated), " for over 30 years, responses to food insecurity in Ethiopia were dominated by emergency food aid, costing on average $265 million per year from 1997–2002. Over time, concerns arose regarding several operational shortcomings in the emergency appeal system's ability to maintain reliable safety net and develop productive assets. While food aid saved lives, it often failed to protect livelihoods, resulting in millions of people sliding into poverty."

By 2000, the lack of sustainability and limited effectiveness of emergency food system was clearly observed. Millions of Ethiopians, largely made up of chronically vulnerable people, were too reliant on donor-supplied food aid for their survival. The challenge was in finding means of integrating relief, asset protection and development in to a single effort that could adequately protect today's vulnerable people while simultaneously reducing future food insecurity (Ibid).

In 2005 the Ethiopian government with multi-donor support designed the Productive Safety Net Program (PSNP).The main objective is to ensure that poor households in chronically food

insecure Weredas will abstain from losing (selling) their assets during shock time and to build community asset via the participation of food insecure households in public works. The program is, in some parts of the country, also purposefully combined with Other Food Security Program (OFSP) so as to encourage poor households to engage in production and investment activities as well as improving their purchasing power and promote market development (Pankhurst, 2009). The PSNP, which represents an innovative effort of government in moving from responding through emergency appeals to a more predictable response with predictable resources for a predictable problem, is one of government of Ethiopia's most important program to achieve the Millennium Development Goal (MDG) (Wahenga brief, 2007).

The PSNP has two components: Public work and direct support. Public work tries to mitigate the impacts of climatic change and food insecurity risk on chronically food insecure farmers by creating job opportunities, provided that the individual is "able-bodied" laborer. It is the main component of the PSNP that facilitates the means of joining labor market for the unskilled poor farmers, who will involve in the labor intensive and community based activities. While direct support is the smaller component of the PSNP that provides assistance for the poor who cannot participate in public work without any pre condition (Anderson et al., 2009).

According to (Nyanen, undated), Environmental degradation has a significant socioeconomic and environmental consequence for the society. It is by considering this facts that the government made clear that one of the objective of PSNP is to avoid the environmental damages that could resulted from some unexpected natural shocks and by integrating the PSNP with other food security program (OFSP) the government is trying its best so that the poor will engage in Sustainable Land Management (SLM) practices like; soil and water conservation, using of fertilizer, abstaining from deforestation etc rather than acting against the environment.

In Ethiopia there are some good works on the impact of PSNP, but most of them have fully devoted in identifying its impact on asset holding and consumption while its impact on practicing Sustainable Land Management (SLM) has got only limited attention. As far as the study area is concerned so far nothing has been identified whether or not participating in the program leads to an increment or a reduction in assets of participants as well as the level of differences between program participants and non-participants to engage in SLM practices. Therefore the study has

tried to assess the impact of PSNP on rural household's asset holding and practicing in SLM activities, in Haramaya woreda.

1.2. Statement of the Problem

As cited in Habtamu (2011), " When poor people encounter shocks, they suffer from the direct effect of poverty and hunger making them less productive and less able to earn a living. They are also forced to employ negative coping strategies such as reducing food consumption, selling productive assets, and removing children from school (Barret, 2001). These strategies further diminish their asset base and make them more vulnerable to the next shock, which leads them to further worse condition. This vicious cycle is referred to as poverty trap. It is difficult for the poor to escape the poverty trap unaided. They require a combination of development activities complemented by social protection transfers such as safety nets (Yadete, 2008)."

In recognition of this fact and up on the realization of the failure of the previous emergency food appeal response, The government of Ethiopia launched the PSNP in 2005 with the objective of protecting asset's of the poor and encouraging them to invest in Sustainable Land Management (SLM) practices and in some parts of the country the program is backed by other Food Security Program (OFSP). Given the problem of market imperfection in the rural areas of developing country in general and Ethiopia in particular, the combination of PSNP and OFSP is an ideal means of overcoming the problems of Adverse Selection and Moral Hazards (Gilligan et al., 2008).

Furthermore, Deaton (1990, 1991), Rosenzweig and Binswanger (1993), have developed a theoretical framework for the role of asset holdings under income uncertainty. They showed that, when there is a credit market failure, households that are sufficiently risk averse will save to smooth future consumption (cited in, Alemu et al.,2009). "There are, however, additional features of the PSNP that make such an assessment especially interesting. Recent work has speculated that social protection programs may, in fact, be integral to policy frameworks that attempt to stimulate economic growth. Particularly in rural areas of Ethiopia, there are pervasive credit and insurance market failures. This has two adverse consequences for agriculture: farmers are liquidity constrained (and therefore, for example find it difficult to purchase fertilizers) and farmers are reluctant to take risks (for example, adopt new crops). Social protection, by

providing liquidity and a reliable source of income addresses both types of market failures" (Gilligan et al., 2008).

In Ethiopia there are some good works that tried to highlights the impacts of program intervention, particularly PSNP, Unfortunately most of them have focused on the impact of PSNP on asset holding and consumption by ignoring its impact on practicing Sustainable Land Management (SLM) activities. Even amongst those tried to focus on asset accumulation: Some findings states that PSNP has able to smooth the consumption and protects household's assets like (Yibrah, 2010), while some others contrarily proved that there is no significant difference between, the consumption as well as assets of, PSNP participants and non-participants like (Tadele, 2011). Moreover, according to Habtamu (2011), participation in PSNP reduces the asset size of the participants. Generally despite some works in the area the findings are far from conclusive. In addition to this some researchers like Habtamu (2011) have tried to assess the topic at country level, but given the socio-economic and ecological variation across the country, micro level studies are necessary to complement the macro-level studies.

It is obvious that one of the objective of the PSNP is to protect the environment or the natural resources either via the public work or the direct transfer so that the rural poor does not engage in acts that destroy the environment like deforestation, over cultivation, supplying charcoal to the market; instead the rural poor works for its sustainability by involving in activities like SLM practices. But only limited empirical findings are available for the country in general and nothing for Haramaya woreda (Harerghe) to prove whether or not the program is effective to ensure PSNP participants are more active in practicing SLM activities as compared to non-participants.

East Hararghe in general and Haramaya in particular is one of the area well known for its drought and associated food insecurity which in part is resulted from deforestation, loss of soil quality, soil erosion, over-population and the resulting over cultivation. This is true especially when we consider the rural poor that engaged in using its asset and natural resources to escape hunger and sudden drought. Considering these the government is working extensively to improve the condition through the introduction of PSNP. But, to the best of the researcher's knowledge, so far nothing has been done to show whether the intended target has been achieved or not; especially its impact on SLM practices although the expectation is a positive impact of PSNP both on the asset accumulation and SLM practices.

Therefore, the study has been designed to examine the impact of productive safety net program on asset building, and rural household's involvement in sustainable land management activities in Haramaya district.

1.3. Objectives of the study

The general objective of the study is to assess the impact of Productive Safety Net Program (PSNP) on rural household's asset building and investment on Sustainable Land Management (SLM) practices.

Given the general and broad objective of the study, the specific objectives are:

- To assess the factors that affect households' participation decision in the PSNP
- To analyze the impact of PSNP on asset holding.
- To analyze the impact of PSNP on SLM practices.

1.4. Hypotheses

On the basis of the previously existing theoretical and empirical literatures, the researcher has developed the following two hypotheses

1. The Productive Safety Net Program has a positive and significant impact on rural households' asset building.

2. The Productive Safety Net Program has a positive and significant impact on Sustainable Land Management practices.

1.5. Significance of the study

Asset accumulation, natural resource management and environmental protection are undoubtedly a major means of poverty reduction and avoiding the problem of food insecurity. Despite this the available studies on the impact of PSNP is limited at the national level in general and not available at woreda level in particular. It was by considering this that the study was under taken to assess the impact of PSNP on asset formation and land management issue. Therefore, the current study has produced, at least in the study area, relevant information regarding the role of

PSNP on sustainable land management and asset formation. Generally the study has the power to provide basis for detail analysis on food security and land management.

1.6. Scope and limitation of the study

The study was limited both in scope and coverage mainly due to the financial and time constraint. Because of this the study was confined only to one district despite the existence of many districts included in the program, in East Hararghe zone; and it considered only 3 PSNP active kebeles as a sample from the possible 14 PSNP active kebeles available in the study district. Moreover, the sample size of the study was 200 rural households selected from the three kebeles included in the PSNP.

Several limitations were faced during conducting this study. First, there is no baseline data before the implementation of the program. So, important data before the intervention of PSNP were collected from farmers through recall which might be subjected to recall biases and inexact answers. Second, despite the fact that the impact of the program can be viewed from various aspect the study did not assess the overall impact of the program, rather, the study was confined only on PSNP impact on asset building at household level and participation in sustainable land management practices. Even for the land management aspects, only soil and stone bund from the soil conservation part, and application of manure and chemical fertilizer from fertility improvement components have been included.

1.7. Thesis organization

This study is organized into five chapters. The first chapter deals with background of the study, statement of the problem, objective of the study, research hypotheses, significance of the study and the scope and limitation of the study. The second chapter presents the relevant theoretical and empirical literatures with the emphasis on PSNP. Chapter three describes the methodology which contains description of the study area, data sources and data types, and the analytical tools. Chapter four describes the results and discussion of the study using descriptive statistics and econometric model. Finally, chapter five presents the conclusions and policy implications of the study.

Chapter Two

Review of Related Literature

2.1. Theoretical Framework

This chapter presents key concepts, theoretical explanations and previous research findings on the related topics to this study. The chapter tries to give the overall concepts of research topic and selectively review the theoretical as well as the empirical aspects of the investigation.

2.1.1. Definition of important terms

“Safety nets are a type of social transfers that mostly incorporate cash or in kind payments to the poorest section of a population either gratuitously or through public works (Mesfin et al., 1997 cited in, Habtamu, 2011). Typically, the program is food/ cash based and they are short term in nature (Deveruex and Sabates-Wheeler, 2004)”.

According to the definition of Wikipedia, an asset is an economic resource that is capable of being owned or controlled to produce value with the ultimate objective of satisfying the material well-being of human. Asset may be tangible like liquid cash, labor and capital or intangible assets like social capital, location, bond and stocks, and empowerment. Physical assets can be broadly grouped as productive asset (like equipments and tools), household assets (like bicycles and radio), livestock and stock (like stored food). Livestock can be serving as a means for agricultural production and transport, and have extra economic and social values (Paul and Jeffery, 1999).

Poverty is emanated from low asset and the associated low productivity of the asset. Households circled by poverty trap are highly vulnerable and their negative response to shocks may bring a reduction in both the quantity and the quality of their asset. Therefore household assets are the stock of capital used as a means of generating well-being (ibid).

Sustainable land management (SLM) is defined in several ways by various institution. These includes: the definition by the World Bank (2006), in which SLM is defined as a simultaneous process that brings together the activities of environmental conservation and the guarantee claim of ecosystem services on one side. On the other side it is all about the enhancement of agricultural productivity and forestry with respect to population growth and the resulting extra pressure in land use. "SLM is defined as a knowledge-based procedure that helps integrate land, water, biodiversity, and environmental management (including input and output externalities) to meet rising food and fiber demands while sustaining ecosystem services and livelihoods".

According to the definition of, The United Nations Economic Commission for Europe (UNECE) "Land management is the process by which the resources of land are put to good effect. It covers all activities concerned with the management of land as a resource both from an environmental and from an economic perspective. It can include farming, mineral extraction, property and estate management, and the physical planning of towns and the countryside"

Based on the above and other definition given by different authors Gete *et al.* (2006) tried to summarize the various SLM practices implemented in Ethiopia in to the following five categories:

Physical soil and water conservation measures: consist of stone and soil bund, stone terracing, '*dinber*', *boy* or '*fesses*' (in farm ditch to divert or drain excess runoff), '*gulenta*' (traditional ditches used to collect runoff from small ditches and act as a waterway, simple check dams (stones and brush) and '*tekebkebo*' (diversion ditches to cut-off the excess runoff from upland areas which are traditionally used by farmers;

Biological soil conservation measures: include below terrace plantation, live fence around homesteads and farm lands, plantation along traditional waterways and diversion ditches, scattered trees like acacia and croton on farm lands, traditional agro-forestry, small-scale woodlots and traditional nurseries;

Agricultural water management measures: like runoff diversion for floods, moisture conservation using crop residues, mulching, small-scale irrigation, and drainage ditches;

Soil fertility improvement measures: contain farmyard manure, fallowing, use of special crops such as lupine inter-cropping, crop rotation and relay cropping compost making and chemical fertilizer; and

Grassland management measures and forestry and agro-forestry measures: these include improved forage plantation (grass, shrubs and legumes) and zero grazing, hay making and temporary blocking of grasslands (cited in Tadele, 2011)

2.1.2. Food insecurity in Ethiopia

'Ethiopia lies within one of the most food insecure regions in the world, with a large number of its population living at subsistence levels and dependent on farm production which is highly vulnerable to severe draughts' (Gezahegn, 1995; cited in Abebaw, 2003).

According to (FDRE, 2001) There are several factors responsible for the occurrence of food insecurity in Ethiopia; Adverse changes in climate, combined with long term factors (technology, environmental and Institutional) led to a decline of land holding, soil degradation and a decline in yield per hectare. Moreover, policy induced stagnation of agriculture and internal conflict during the 1970s and the 1980s are also factors that have aggravated the problem. The combination of the above factors along with the effects of repeated drought over the years has significantly reduced the assets as well as the productivity of communities and households. More importantly the same source indicated that as a result of the households' inability to accumulate livestock holdings and food stores even in the years of good production, there is a continuous rise in vulnerability and food insecurity as well as the number of people who are failing to gets enough food from domestic sources. Because of the above factors the level of education is low and the prevalence of diseases is high and this issue exacerbated the situation of food insecurity. Before 2005, the response to food insecurity was dominated by emergency food relief program that failed to protect the asset of the rural poor. The victims sell their asset and this pushes them down in to severe poverty (MoARD, 2009).

2.1.3. Safety Net Program in Ethiopia

The Safety Net Program in Ethiopia is termed as the productive Safety Net Program (PSNP). The PSNP is currently the largest functioning social protection program in sub-Saharan Africa

outside of South Africa. The distinguishing feature of this program as compared to the previous food-for-work programs is that in the case of the PSNP, the program is entirely focuses continuously on selected households over several years and in that the explicit objective is that it will eventually be phased out (Anderson et al, 2009).

The program is meant for creating transfers to the poorest segment of the rural population in chronically food insecure weradas in such a way that the transfers protects the individual assets from depletion while simultaneously creating community asset, which is to smooth household consumption, to protect household assets and to create assets at the community level (Government of Ethiopia, 2004). As cited in Habtamu (2011), The program solves urgent human needs while simultaneously stimulating markets, improving access to services and natural resources, and rehabilitating and enhancing the natural environment (PSNP PIM, 2010).

The PSNP operates in two ways, through public works (PW) and direct support (DS). (i) Public works, the larger of the two programs, employs selected beneficiaries for 5 days/month on labor-intensive projects designed to build community assets. (ii) Direct support, in the form of cash or food transfers, is provided to labor-scarce households including those whose primary income earners are elderly or disabled in order to maintain the safety net for the poorest households who cannot participate in public works (Government of Ethiopia, 2004).

The PSNP delivers social transfers to over 8 million Ethiopians, with three distinct objectives and two important principles: the first two objectives are short-term while the third is long-term.

The first is protecting against hunger (food consumption smoothing) in chronically food insecure small rural households; it involves closing the gap between the supply and demand of food through raising productivity and transferring cash or food to buy food during the food gap season. The second is protecting household asset via preventing damaging coping strategies that could cause exposure to future hardship; like selling productive assets or exchanging assets for food. The third one is (promotion of sustainable livelihood) building assets at community level by choosing public work activities that have the potential of creating development oriented infrastructures while the principles are timely deliverance of the transfers and preventing dependency by trading the transfers for public work service (Devereux et al, 2006).

2.1.4. Rational for the productive Safety Net Program

In order to satisfy the unfulfilled consumption need of millions vulnerable rural households, the government appeals every year, on an emergency basis, for food aid. But upon the recognition of the failures of the emergency food aid, in 2005 the government of Ethiopia introduced a new program termed as, the PSNP, which represents an innovative efforts of government in moving from responding through emergency appeals to a more predictable response with predictable resources for a predictable problem, is one of government of Ethiopia's flagship programs and it indicates a change in government strategies to achieve the Millennium Development Goal (MDG) (Wahenga brief, 2007).

The government has decided that, the system which was dominated by emergency humanitarian aid, to meet the food gap of vulnerable rural poor, should be urgently replaced by the PSNP that is financed by multiyear predictable resources. This is because, the emergency response did not give resilience to further problems on a long term basis as it lacks predictable resource provision and unable to avoid further deterioration of the poor rural households' asset. Moreover, the program made insignificant contribution in the effort to build community assets (Gilligan et al., 2009). Since the PSNP has the objective of abolishing the food gap, faced by the rural vulnerable households, in a sustainable manner it has impressed the governments of most developing countries that share the objective of addressing poverty and attaining the MDGs (Samson et al., 2007). There are different scholars that have tried to justify why a country should introduce the productive safety net program in avoiding the transmission of deep rooted poverty from generation to generation in their own country. In supporting the point raised by different scholars some of the relevant literature is examined.

Most of the times the credit institutions are reluctant to provide the credit to the poorest segment of the population and this is caused by the inability of the poor to prove his/her credit worthiness by providing the necessary collateral. However according to Barrientos and Scott (2008), social transfers (safety net) can avoid the collateral constraint faced by the poorest section of the rural household in two main ways:

Firstly, social transfers, provided that they are regular and reliable, can provide the incentives to increase the saving as well as investing capacity of the rural poor which in turn gives another

opportunity to the poor in escaping the financial constraint. Secondly, social transfers could prove more effective; in enabling access to credit via alleviate credit constraints by facilitating access to bank loans without the need for collateral (ibid). Thus the condition that the poor are benefiting from the transfers is serving as collateral.

According to (Dercon, 2005; Jalan and Ravallion, 1999, cited in Habtamu) insurance market very rarely reaches to the poor and the poorest implying that they have the minimum protection during the period of some hardship. This insufficient protection has its own negative impact on the poor in their attempt to exit poverty and getting the benefits of economic advancement both at country and global level. Insecurity leads to inefficient use of resources by those in poverty (Barrientos, 2007). It, for example, reduces growth opportunities by forcing rural poor households to become risk averse and opting for low-risk/low-return crops and production methods (Morduch, 1995). Insecurity also forces poor households to holding liquid but less productive assets and this may hamper an emergency production expansion (Dercon, 2003).

It may also leads to alteration of the opportunity cost between future and current consumption i.e, during this condition the poor gives more weight to current consumption at the expense of future consumption. This is typically the case when households withdraw children from school or 'economize' on health care in response to crises. In the absence of security, responding to short term shocks can lead to poverty persistence. Thus Regular and reliable social transfers can improve household security, firstly through providing household income and hence minimizing the damage of consumption shocks; and secondly through integrating insurance features protecting consumption, assets and investment (Barrientos and Scott, 2008).

On top of the above, there is strong evidence demonstrating that conditional social transfer programs bring large improvements in human capital accumulation among the poorest beneficiaries. This is highly supported by the evidence on the capacity of social transfers to affect positively the school attendance of the children in beneficiary households. In line with the above argument, social transfers have also a positive impact on the health status of the beneficiaries, which is also likely to improve earnings and productivity. (Barrientos and Scott, 2008).

According to (Alderman and Hoddinott, 2007; cited in Yibrah, 2010), social safety net programs intervention can leads to economic progress through their positive impact on asset creation, asset

protection, resource allocation and redistribution. Social Safety Net Programs interventions, when well-designed and implemented, can complement pro-poor investments. Therefore, the program can tackle poverty in a sustainable manner on top of their short- term impact.

2.2. Empirical Literature

This part of the research tries to examine some of the previous empirical studies conducted on the related topics and that has a significant connection with the topic at hand.

2.2.1. Impacts of the productive Safety Net Program on Asset holding and Sustainable Land Management

Household can smooth consumption by borrowing and saving, accumulating and depleting assets, adjusting labor supply and implementing formal and informal risk-sharing arrangements (Morduch, 1995; cited in Yibrah),

In European Union the impact of social transfer (safety net) on poverty is paramount. The study by Dafermos and Papatheodorou, (1995) is not confined to examine the impact of social protection on poverty and inequality alone rather it also includes the impact of economic growth on poverty. This may help us to compare the impact of social protection and economic growth on poverty and inequality. They proved the significant role of social transfers in cash, and especially of other social transfers, in minimizing poverty and inequality. They also come up with the fact that social transfers have a more crucial role than per capita GDP in the decline of income inequality and poverty. Their results suggest that a 1 percentage rise in other social transfers (as a percentage of GDP) has equal effect with a rise in per capita GDP by 3-5% when it comes to declining in equality and the same social transfer is equal with an increase in per capita GDP by 8-10% when it comes to the fall in the poverty rate. The only minor problem of their study is that it focuses at macro level not at the individual level.

According to Dewen (2010) who utilized both descriptive and econometric analysis to see the impact of social safety nets in china. The descriptive part of his analysis come up with the fact that there is significant difference in the consumption and savings behaviors between urban households who are beneficiary of social security coverage and those without the program.

The protections of the poor including the new entrants to the poverty condition were the basic aim of the Indonesian's social safety net programs. The study by (Safriansyah, 2008) has tried to review the performance of social safety net program in Indonesia and he found that most of the program has managed to minimize the economic difficulties faced by many Indonesian during the economic downturn of 997. According to the author, the program has made a significant contribution in terms of reducing the share of poor people across the country; poverty reduced slightly from 17.4 to 15.5 percent between 1997 and to late 2000.

Previous studies in Ethiopia have shown that food for work programs (which had similar aim with PSNP except that PSNP focuses continuously on selected households over several years and it will eventually be phased out, Anderson et al., 2009) had a positive impact on the probability of using chemical fertilizer, which is one of the sustainable land management activity under the fertility improvement practices (Sosina and Holden, 2007; cited in Tadele). However, as cited in (Andersson et al., 2009), other studies have found a contradicting results that shows the program may have an adverse influence on agricultural intensification (Barrett *et al*., 2004) and short-term soil conservation measures (Gebremedhin and Swinton, 2003). This two results indicated that the program have an indeterminate impact on practicing sustainable land management activities. (Andersson et al., 2009) have also conducted a study on Impacts of the Productive Safety Net Program in Ethiopia on livestock and tree holdings of rural households using panel data. The result of their study proved the fact that participation in the program has increased the number of trees planted. This result shows that tree planting, which is the main component of sustainable land management activity, is highly practiced by program beneficiary households as compared to the non beneficiary households.

Guush et al (2011) have indicated that beneficiary households have managed to significantly improve their food security status by 1.05 months which indicates that after the introduction of the program the number of months in which food shortage occurred has reduced by 1.05 months. Moreover, the joint receipts of the PSNP and OFSP have registered the accumulation of 1.00 TLU more than households that received neither. Households receiving both PSNP and OFSP accumulated 133 birr more in tools than households that received neither.

The result of their study shows that, due to the program the beneficiary households have managed to escape the damage of selling their productive asset such as livestock, i.e, due to the program the assets of the program participant have been protected. The program is also promoting a number of productive investments like investment on education. In addition to this the program is also able to make the poor to feel more secured in their income which in turn makes them less risk averse and encourage them to adopt advanced farm technology. This indirectly enhances the asset accumulating role of the Productive Safety Net Program. Similarly a study on the impact of the PSNP by Yibrah (2010) indicated that, the PSNP beneficiary households have registered improvement in their assets (livestock holding, productive asset, durable goods and household items). He concluded that, the program has positive and significant impact in protecting rural households' assets and the program is effectively attaining its objectives.

As studied by Devereux et al (2006) around 60 percent of PSNP beneficiary households managed to avoid losing of their productive assets so as to purchase food. The result of this study shows that the program helps participants to protect their assets from supplying to the market during the hardship season and almost one-quarter of the PSNP beneficiary households obtained new asset for their family and this result indicates that the program has achieved one of its basic objective which is the protection of the household's assets. The empirical finding of the researcher proves the fact that the program has a positive and significant impact on the assets of the poorest section of the rural households. As far as the assets are concerned, the PSNP-beneficiary are less likely to taste the damaging effect of downward sliding in asset ownership as compared to the non-beneficiary and the main reason for the downward sliding in asset holding is the need to generate money to purchase foods. On the other hand 62 percent of PSNP beneficiary households reported being effectively protected against distress sales of assets for essential purchases, while 23 percent even recorded improvement in their asset ownership over the year.

According to the study conducted on the impact of PSNP on livestock using tropical livestock unit (TLU) as a means of comparison, by Shimeles (2009), for the PSNP beneficiary households the average TLU has moved from 1.234 to1.755 showing an increment while for those who are not included in the program the result shows a downward sliding feature in the size of TLU.

Hence according to the finding of Shimeles the mean variation of the two group i.e between beneficiary and non-beneficiary was statistically significant at less than 1 percent. The researcher also indicated that as compared to the non-beneficiary group program participant households have increased their asset value by 1097 birr. Similarly Barnes (2008) has stated that PSNP has stabilized and highly enhanced the living standard of millions of Ethiopians who are poor and residing in rural part of the country. in line with the intention of the PSNP community assets are being built, livelihoods are being protected and enhanced and the yearly demand deficit in food has been filled (cited in Yibrah, 2010).

There is also a study by Gilligan et al (2008) that assessed the impact of Ethiopia's PSNP using the method of propensity score matching method and this study has indicated the fact that the program is having a positive and significant influence on the selected indicators. According to this study, as compared to non- beneficiary households, PSNP beneficiary households have higher probability of being food secured, and are more likely to borrow for productive purpose, apply improved agricultural technologies and run off-farm own business activities. But, despite the growth in the size of their assets, compared to the non-beneficiary households, PSNP-beneficiary households did not manage to record faster growth in asset.

According to Habtamu (2011), who used a panel data; PSNP reduces the asset holding of beneficiary households compared to non-beneficiary households. In other word, the asset holding of the beneficiary households has shown a reduction which is explained by the fact that asset holding of both PSNP beneficiaries and non-beneficiaries have grown by 5.6 % and 42% respectively. However, since the growth in asset holding by non- beneficiaries is higher than that of the beneficiaries, the program impact became adverse. The result from this analysis shows that The asset holding of households is significantly reduced by 32.7% in this case.

Other researchers like Tadele (2011), have assessed the impact of Productive Safety Net Program by using the method of propensity score matching. He founds that, participation in PSNP had not brought a significant impact on both asset accumulation and on SLM technologies and the insignificant impact of PSNP on asset accumulation obtained in this study might be because households in the study area use the PSNP transfer mainly for consumption smoothing purpose than asset accumulation. His study has identified that the assets of PSNP beneficiary households are small in size and the majority of their assets are poor in quality which implies that the

program do not bring a positive impact on the assets of the participants. The finding of this study has pointed out the fact that program beneficiaries are still stayed poor, their domestic assets are limited and their estimated values are relatively small.

Anderson et al., (2009) also assessed the impact of the program on livestock and tree holding of the rural households using the method of propensity score matching and regression analysis and his analysis has pointed out that there was no improvement in the livestock holding of the poor as emanated from being the beneficiary of the program i.e, statistically the program is proved to have insignificant impact on livestock holdings of the beneficiary households.

Overall, all the points that has been raised above reflects the fact that different researchers that have tried to analyze the impact of the program both domestically and abroad has brought paradoxical and conflicting results on the impacts of the program. Moreover, a survey concerning the impact of productive safety net program on rural asset protection and sustainable land management is yet to be commenced, and remain untouched at zonal and woreda level.

Chapter Three

Research Methodology

In this chapter the description of the study area, how data is collected and types of data are presented. In addition to this the detail description of methods and techniques of data analysis are presented.

3.1. Description of the Study Area

3.1.1. Location and Physical Characteristics of Haramaya Wereda

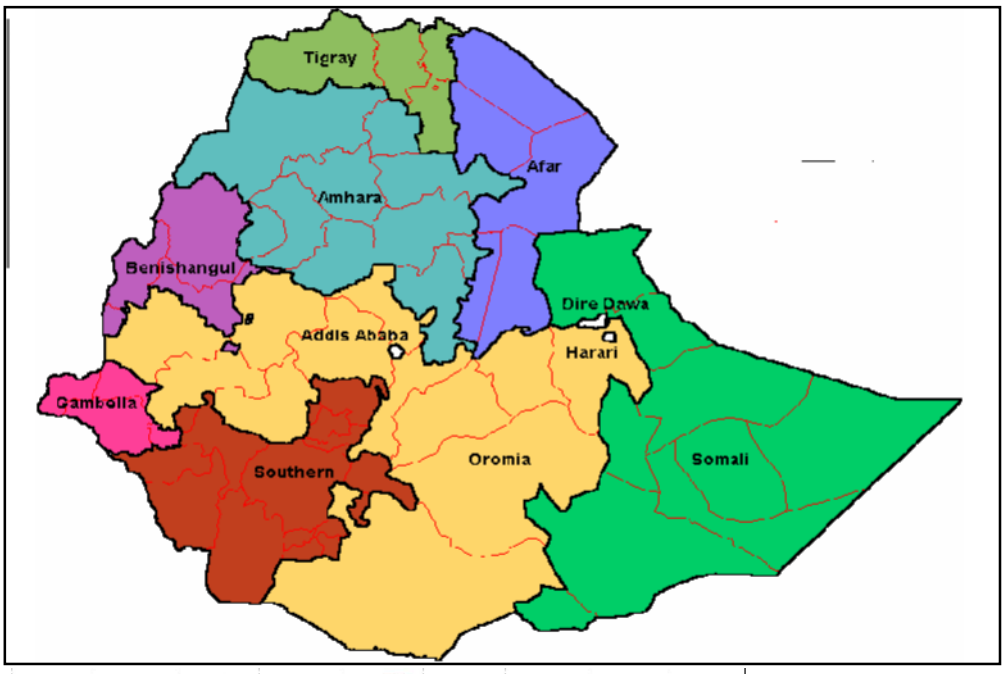
Haramaya, which is situated in the eastern part of Ethiopia, is one of the *weredas (districts)* of East Hararghe zone of Oromia regional state. It lies between 9^0 22' 03"- 9^0 27' 12" N latitude and 41^0 58' 14" – 42^0 05' 26" E longitude (Mohammed, 2006). It is situated on the main road from Addis Ababa to Harar town at a distance of 505 km from Addis Ababa and 20 km north-west of Harar town and the altitude of the *wereda* ranges between 1980 and 2343 m.a.s.l. (Harar Water Supply and Sewages Authority & Karamara Engineering Consultancy, 2006). Haramaya *wereda* consists of 33 (13 of them are lowland) rural kebeles and it is bordered by Kurfa chelle, Kersa, Dire Dawa, Kombolcha and Harari region in south, west, north, east and south east directions, respectively. This can be shown from the location map of the *wareda* in map 3.1.

3.1.2. Demographic and Socioeconomic Characteristics of Haramaya *Wereda*

Haramaya *wereda* is 15^{th} populous *wereda* among 245 *weredas* of Oromiya regional state. But in terms of density it is the second in the regional state after Deder, which is also found in East Hararghe (Ethiopian Demography and Health Report, 2008). According to CSA Statistical Report of the 2007 Population and Housing Census, the *wereda* has a total population of 271,394. Out of which 138,376 (51 %) are male and 133,018 (49%) are female. The majority of the *wereda* population live in rural areas which constitute 220,408 (81.2%) of the total where as the urban dwellers are only 50,986 (18.8%) of the total. The great majorities of the households residing in the *wereda* are engaged in subsistence and cash crop agriculture and livestock rearing. Farming is practiced through rain fed as well as irrigation mainly to cultivate maize,

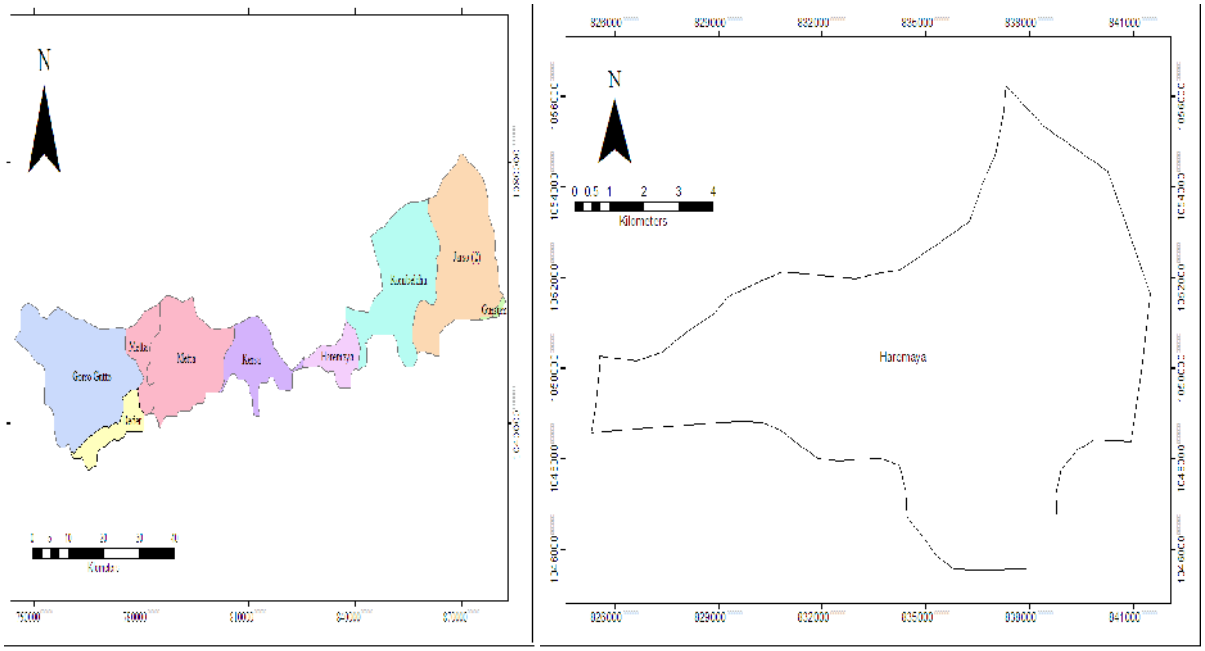
sorghum, and chat (Harar Water Supply and Sewages Authority and Karamara Engineering Consultancy, 2006).

The woreda has graduated 1325 PSNP beneficiary households from the total of 5503 PSNP beneficiary households selected in 2006 and the graduation time was 2003 and 2004 Ethiopian calendar. Out of the current total PSNP beneficiaries of the woreda, who are not graduated as yet, 2539 are male and 1007 are female headed households benefiting from the public work components of PSNP while, 289 are males and 343 are female headed households benefiting from the direct support (WOARD, 2013).



1. Geographical map of Ethiopia, in which Oromia regional state is with yellow color

2. Oromia regional state map: East Hararghe zone is located in the most east of the region shaded (purple color)



3. East Hararghe zone Location map: Haramaya Woreda is located in the center (light purple color) 4. Map of Haramaya Wereda

Sources: 1. http//www.ethiopiscollege.org.et 2. Demographic and health report, 2008

3 and 4: Adem, 2011.

Figure 3.1: Location of the study area in Ethiopia

3.2. Sources of data and Sampling techniques

Types and sources of data: The researcher has used both primary and secondary data. The primary data was collected from the selected sample households using structured and semi structured questionnaire, focused group discussion that involved community leaders, the DA, woreda and kebele leaders and own field observation to generate accurate and in –depth information on the selected research topic. The information on the household survey, from both the PSNP and non-PSNP households, includes: households demographic characteristics as well as asset holding, credit access, shocks, pre-program number of months in which food gap experienced, pre-program access to non-farm income, housing condition, land size were the main area of the data collection process while the secondary data was collected from the government offices at woreda and zonal level.

Sampling procedure: After purposely choosing Haramaya based on its wide coverage of the PSNP, a two stage sampling technique was employed. In the first stage; from the total 14 PSNP-beneficiary kebeles 3 kebeles were randomly selected and the selected kebeles are Haka- fila, Karo-terkanfi and Adu-bate. These kebeles have a total population of 1589 rural households. From this total sample population, 948 are PW-PSNP beneficiary households while 101 of them are direct-support PSNP beneficiary households and the remaining 540 households are eligible non-beneficiary. In the second and final stage; total sample size of 200 rural households were drawn based on the population size of each kebele. Having non-beneficiary households from the same communities as PSNP beneficiaries helps to control for enough pre-program observable household and community characteristics that are correlated with program participation and the outcome variable by providing a similar distribution of unobserved community characteristics like economic shocks (Gilligan et al., 2008). By giving due attention to the number of beneficiary and non-beneficiary households, 110 beneficiaries and 90 non-beneficiary households were selected based on simple random sampling procedure from selected kebeles. The list of household heads for both participants and eligible non participants group was obtained from the lists available in each of the selected kebeles. Moreover, according to the information obtained from the woreda officials all the households currently benefiting from the program have been placed in the PSNP in the same year and there is no households refused to participate after getting the participation license.

Table 1: Determination of Sample Size and Household head type

Name of kebele	PSNP-beneficiary households			Non-PSNP-beneficiary households			Total Sample size
Name of kebele	popula	%	Sample	Popula	%	Sample	
Haka-fila	400	38	42	150	28	26	68
Karo-terkanfi	330	32	35	250	46	41	76
Adu-bate	319	30	33	140	26	23	56

Source: own sampling procedure, 2013

3.3. Methods of data analysis

To understand the distribution of the covariates across the two groups, simple descriptive analysis, such as mean, t-values and percentage has been done. In addition, to the simple descriptive analysis, to estimate the impact of participation in the Productive Safety Net program on asset holding and Sustainable Land Management practices an econometric model (Propensity Score Matching method) was also applied..

3.3.1. Propensity Score Matching (PSM) Method

As placement to participate in PSNP is not random, i.e, an eligible household is deliberately selected based on asset size, vulnerability to shocks and food insecurity plus there is no base line survey in the study area prior to the program intervention the method of PSM is the ideal tool to analyze the objectives of the study. According to (Gilligan et al., 2008), this model assumes that, after controlling for all pre-intervention observable household's and community's characteristics that are correlated with both program participation and the outcome variable, untreated group have the same average outcome as the treated group would have had they did not receive the program.

Procedures to estimate Propensity Score (PS): It is the first step of PSM technique. Rosenbaum and Rubin (1983) revealed that matching can be performed conditioning only on P(X) rather than on X, where P(X) = Prob (D=1|X) is the probability of participating in the program conditional on X. According to these authors, if outcomes without the intervention are independent of participation given X, then they are also independent of participation given P(X) which reduces a multidimensional matching problem to a single dimensional problem. Estimating the propensity score involves two types of decision. These are which model should be used and the variables that should be included in the model.

Concerning the type of the model to be used, since propensity score represents the probability of participation or non participation in PSNP, binary outcome, both the model of logit and probit delivers the same outcome. However, due to the complexity of estimation procedure of probit model than the logit model, logit is widely used (Caliendo and Kopeinig, 2005). To capture this

advantage, the logit model will be used for estimating the propensity score. While as far as the variables to be included in the logit model are concerned, according to (Anderson et al., 2008), when estimating the propensity score, it is important that the variables used to predict the probability of participation are unaffected by treatment, i.e., they should be measured before the implementation of the program or be fixed over time. Therefore, implementing matching method is based on choosing a set of variables *X* (covariates) that reasonably satisfy this condition. Basically, economic theories, better knowledge of previous researches and information on institutional settings are important guides to select appropriate covariates (Sianesi, 2004; Smith and Todd, 2005).

In calculating the logit model, the dependent variable is participation which takes 1 if the household participate in PSNP and 0 other wise, mathematically (Gujarati, 2004) :

$$Pi=\frac{e^{zi}}{1+e^{zi}} \qquad (1)$$

Where, Pi -is the probability of participation in the program (PSNP)

$$Zi = \beta o + \sum Bi\ Xi + Ui \qquad (2)$$

Where:

βo - is the intercept

i= 1,2,……..n

Bi-is regression coefficients to be estimated

Xi-is pre-intervention characteristics

Ui-is a disturbance term

The probability that the household belongs to non-participant group is given by:

$$1\text{-}pi = \frac{1}{1+e^{zi}} \qquad (3)$$

Then the odd ratio can be written as:

$$\frac{pi}{1-pi} = \frac{1+e^{zi}}{1+e^{-zi}} = e^{zi} \qquad (4)$$

The left side of equation 4 ($\frac{pi}{1-pi}$), is simply the odds ratio in favor of participating in the PSNP. It is the ratio of the probability that the household would participate in PSNP to he/she would not participate in PSNP. By taking the natural log of equation (4), the log of odds ratio can be written as:

$$Li = Ln(\frac{pi}{1-pi}) = Ln(e^{zi}) = Zi = \beta o + \sum BiXi + Ui \qquad (5)$$

Where Li- is the log of the odds ratio in favor of participation in PSNP which is linear both in Xi and parameters.

Based on the results of previous empirical studies on PSNP and the eligibility criteria for participation in PSNP as many relevant pre-intervention explanatory variables as possible were included in the logit model.

Once the propensity score is estimated and by following the model used by (Zaid, 2008), the effect of treatment on outcome say (Y) can be stated as:

Let's say we have an individual participating in the program and some others who are not, and denoting the outcome variable of the treated individual by Y1i and that of the non-treated By Y0i, we can put the effect of treatment as (Y1i - Y0i). For a group of individuals, one has to Use the mean of outcomes across all the participants and non-participants, which will then give us the expected value or average effect of treatment. This is known as Average Treatment Effect (ATE) in the evaluation literature (Wooldridge, 2002; Cameron and Trivedi, 2005).

Thus, for a population we have the following with E standing for expected value or mean:

$$ATE = E(Y1i - Y0i) \qquad (6)$$

The sample equivalent of the above equation is given as follows:

$$ATE = \frac{1}{n}\sum(Y1i - Y0i) \qquad (7)$$

But the intention is to estimate impact of treatment on the treated, which is the average gain of participating in PSNP only for those households that are participating in it (participants and eligible non-participants).accordingly impact is measured as the gap between what is happening to households participating in PSNP and what would have happened for the same households had they not participated in PSNP. Mathematically:

$$ATT = E(Y1i - Y0i \mid Di = 1)$$

$$= E(Y1i \mid Di = 1) - E(Y0i \mid Di = 1) \qquad (8)$$

Where Di, is the participation dummy taking the value of 1 if the household participate in PSNP and 0 if it is the other way.

E-indicates the expected (average) value.

The sample equivalent is given as:

$$ATT = \frac{1}{n}\sum(Y1i - Y0i) \mid Di = 1 \qquad (9)$$

The factual outcome or outcome with PSNP (Y1i | Di = 1) is observable for household participating in PSNP But here the problem is the counter factual outcome or the outcome without PSNP (Y0i | Di=1) is not observable for the same household as it is impossible to get the same individual with and without PSNP simultaneously. This indicates that there is a variation between what an individual directly observe from the data and what an individual desire to measure and it is because of this reason that the problem of impact evaluation is termed as problem of missing data (Ravallion, 2001; 2005; Heckman et al., 1998; Hahn, 1998; Wooldridge, 2002; Cobb-Clark and Crossley, 2003; Cameron and Trivedi, 2005).

If E (Y0i | D = 1) and E (Y0i | D = 0) were equal, there wouldn't be any variation between what we want to measure and what we observe making our impact evaluation a straight forward task. Had this been true, impact would be the difference between the mean outcomes of program

Participants and non-participants of the outcome of interest. Such a naïve

And simplistic result cannot be happened in non-experimental or observational data. Impact

Evaluation measures the causal effects of program participation rather than providing a simple comparison of outcomes between the treatment group and the control group (Pitt and Khanddker, 1998).

To deal with the above problem, we are thus left with the possibility of using the outcomes of non-treated individuals (control group) using which we can measure what treated individuals would have received had they not participated. The average treatment effect can also be written as follows (Wooldridge, 2002; Cobb-Clark and Crossley, 2003; Cameron and Trivedi, 2005).

$$ATT = E(Y1i \mid D = 1) - E(Y0i \mid D = 0)$$

$$= E(Y1i - Y0i \mid D = 1) + E(Y0i \mid D = 1) - E(Y0i \mid D = 0) \quad (10)$$

Had participation in PSNP been random ($E(Y0i \mid D = 1) = E(Y0i \mid D = 0)$), equation (10) would have been valid. But the reality is placement to PSNP is not random rather it is based on asset size and vulnerability to food insecurity as well as shocks. So using equation (10) would leads to the problem of selection bias which shows variables that affect household's participation in the PSNP could also affect household's asset building and involvement in SLM practices. This implies that, the change (difference) on the outcome of interest is not only from the participation in PSNP but could be also from other factors.

There are two strong assumptions to cope with the problem of self-selection bias these are:

A. Conditional Independence Assumption (CIA): The CIA is given as:

$$(Y0, Y1) \perp D) \mid P(x) \quad (11)$$

Equation (11) says outcome and participation are independent given the propensity score (P(x).Using their assertion that 'treatment assignment is strongly ignorable', Rosenbaum and Rubin (1983) displayed that, for non-randomized observations, outcome and treatment are conditionally independent given the propensity score,P(x) , which is the conditional probability of receiving treatment given pre-treatment characteristics. The implication of this assumption is for an individual with the same propensity score, P(x) , potential outcomes (asset accumulation and level of investment in SLM activities) are independent of treatment assignment (independent of how the households were selected in PSNP).

B. Balancing condition: A balancing condition needs to be satisfied for propensity score matching. The balancing condition shows the conditional independence of participation in terms of control variables given the propensity score:

$$D \perp X \mid P(x) \qquad (12)$$

Thus if equation (12) is fulfilled, observation with a similar propensity score will have identical distribution of observable and unobservable characteristics irrespective of treatment (Becker and Ichino, 2002). 'The propensity score reduces the high dimensional matching problem in to one dimensional problem provided that p(x) is known (Heckman et al, 1997; Cobb-Clark and Crossley, 2003).

Once the propensity score is calculated and the balancing condition is met, impact or ATT can be estimated as shown in (13) below. Using the propensity score to deal with selection bias,

Equation (8) is thus modified as (Becker and Ichino, 2002):

$$\begin{aligned} ATT &= E\,(Y1i - Y0i \mid Di = 1) \\ &= E\,(E\,(Y1i - Y0i \mid Di = 1, P(xi))) \\ &= E\,[E\,(Y1i \mid Di = 1, P(xi)) - E\,(Y0i \mid Di = 0, P(xi)) \mid Di = 1] \end{aligned} \qquad (13)$$

Based on economic theory and previous empirical studies, a set of demographic and socioeconomic characteristics of the households in the study area, that are expected to affect both participation in PSNP and the outcome of interests (asset holding and participation in SLM practices), were included as explanatory variables.

The propensity score, which indicates the probability of participation, is a continuous variable and it is almost impossible to have two or more observations that possess exactly the same propensity score. Hence, with exact matching hardly possible, we resort to inexact matching where we match observations on the basis of nearness of their propensity scores (Cameron and Trivedi, 2005). But the question is how one can match treated and non-treated observation based on closeness of propensity score. Despite the existence of plenty methods to do so, only four of

them gets attention here. Although, one can consider either one or the other methods for measuring impact, their consideration in tandem has an advantage because it can be used as a way of measuring the robustness of the results obtained (Becker and Ichino, 2002).Hence, the study will employ the methods of nearest neighbor, kernel, radius, and interval matching to match the treated and untreated observations. The detail of each of the four matching methods is presented as follows.

Stratification (interval) matching*;* it begins with classifying the entire data set into intervals with each interval having on average a similar propensity score. The participant and eligible non-participant units within that interval of propensity score will be placed under one block and the average difference of the outcome between the participant and eligible non-participant units will deliver the treatment effect for that block. The mean difference of the entire blocks will eventually gives as the ATT for the whole sample. However, this method does not take in to account blocks without the participant or eligible non-participant observations for computing the ATT (Becker and Ichino, 2002). The problem in this method is 'how much strata should be used in empirical analysis?' The solution to this problem as noted by Cochrane and Chambers (1965) is using five strata can minimizes 95% of biases.

Nearest neighbor matching (NNM): this method ensures that each participant is considered by matching it with a non-participant observation that possesses the closest propensity score. Hence, for each participant unit, a nearest neighbor is sought from the non-participant unit on the basis of its value of propensity score. Here, it is possible that a non-participant unit can be a nearest neighbor for more than one participant observation provided that the NNM is with replacement but if the NNM is without replacement it will be considered only once. After matching each participant unit with a non-participant unit, the difference in their outcome is calculated and the mean of these differences for the whole sample gives us the ATT (Caliendo and Kopeinig, 2005).

In the case of stratified matching, participants that do not find a match from the non-participant observations within their block will be discarded. But In nearest neighbour matching, while it is possible that non-participant observations can be discarded, each of the participant observation is considered by matching it with a non-participant observation that have the closest propensity score irrespective of how far the closeness can be (Zaid, 2008).

Radius matching: in this type of matching each participant observation will be matched with those non-participant observations that fall within a pre-specified neighborhood (radius) of the propensity score of the participant observation. Here the size of the radius plays an important role. If it is set to be very small some observations from the participant may not be considered because they may not find a match from the untreated group. But better matches may be produced with smaller sizes of the radius (Becker and Ichino, 2002).

Kernel matching: it is a type of matching estimator that apply the weighted mean of the entire individuals in the untreated group to construct the counterfactual outcome and have the potential of overcoming the problems of only a few observations from the untreated group are used to establish the counterfactual outcome of a participant individual that other estimator have in common. This method is advantageous in lowering variance as it uses more information. However, it also have a drawback of the probability of using observations having bad match which leads to the importance of imposing the common support condition (Caliendo and Kopeinig, 2005).

3.4. Definition of variables to be included in the logit model and their expected sign

Based on economic theory, previous findings on the topic and the eligibility criteria to participate in the PSNP, a set of socio-economic and household's characteristics have been included in the logit model as an explanatory variables. According to (Sianesi, 2004; Smith and Todd, 2005; cited in Grilli and Rampichini, 2011) The underlying characteristic of these variables is expected at least in theory to affect both placement to the program (being the PSNP beneficiary) and the outcome of interest (asset holding and undertaking SLM practices). According to (Rosenbaum and Rubin, 1983), to ensure these variables are not affected by the participation in the program, either the variable should be fixed over time or their lagged value should be taken. Due to this, the lagged value of the suspected variables has been taken (table 2). Variables like: Land size, Access to non-farm income, number of months experienced food gap, livestock (TLU), Oxen holding and Ownership of corrugated iron roof house, all these variables taken their lagged value.

Age of the household head: it refers to the level of experience the farmer's possess and it is a continuous variable measured in the number of years. As agriculture is a volatile business, i.e, it

is sensitive to drought and inappropriate usage of inputs; hence, experience is highly matters both for the success and failure of the business. The older the head of the HH is the more he/she would be effective in risk diversification as well as in predicting the weather and applying the right technology. Therefore, it is hypothesized that the more the head of the HH is older the more he/she would be likely to be food secured. But as the age goes beyond certain stage, the person may become physically weak and food insecure which contradicts the above reasoning. This implies that the expected relation between this variable and participation in the PSNP is indeterminate.

Sex of the household head: in a backward country like Ethiopia, agriculture is highly a labor intensive activity, given this facts female headed HHs are more likely to be less effective in feeding their family in a sustainable manner from year to year which makes them more likely to be food insecure. Hence, there is a positive relation between being female headed and participation in PSNP. On the other hand, According to Yibrah (2010), due to lack of labor in the female headed households, they are forced to rent out their land as a share crop. Hence, male headed households are in a better position to pull labor force than the female headed ones. This gives the male headed household a higher chance to be PSNP participants, especially in the public work components of the PSNP. Therefore, it is hypothesized that this variable has indeterminate effect on PSNP participation.

Family size: this is a continuous variable that refers to total number of the household's member. As the number of the family increases, given the fixed resources, the food share goes to the individual in that family declines which maximizes the probability of being food insecure. Therefore it is hypothesized that there is a direct relation between having large family size and being PSNP beneficiary.

Number of male and female adult labor force in the household: this is a continuous variable that refers to the household's member between the ages of (15-64). In a family where the number of active labor force is high there is a lower chance of being in a condition of food shortage provided that the environment allows for more productivity. Hence, participation in PSNP and having large active labor force in the household is inversely related, the argument is a family with more active labor force can generate income from different directions.

Educational status of the household head: this is a continuous variable that indicate the household head's educational background in number of schooling years. Not only in agriculture sector but also in every sector, education is vital for success. This is because a farmer with education would easily accept new technologies like improved seeds, fertilizers and other related extension services which minimizes the chance of being food insecure. Furthermore, a literate head can easily process and take advantages of any farming as well as marketing information delivered by state media which reinforces the above argument. So the expectation is literate household head is less likely to be PSNP participant compared to the illiterate one.

Cultivated land size: it is a continuous variable that represents the total operated land size in Timad, owned by a household. Land, which is one of a crucial fixed input in the agricultural sector, has a positive relation with the amount of yield provided that other inputs are available. In the study area the main reason of being food insecure is due to the shortage of agricultural land which resulted from the inability of the fixed land to accommodate the ever growing population. Therefore the more the land is larger the less is the probability of the households to be food insecure which implies the less is the chance of being PSNP beneficiary.

Off farm income: it is a dummy variable representing any type of income a household manages to earn from non agricultural activities, before the implementation of the program. This includes; petty trade, labor selling, renting of oxen, pottery, weaving, hand craft activity and etc. Since in most cases the income generated from the agriculture is not enough to support the whole expenditure of the rural household, non-farm income has a big role to play in ensuring food security. Hence, it is hypothesized that there is a negative relation between having off farm income and the probability of being PSNP beneficiary.

Corrugated iron roof house ownership: Due to the difficulty of exactly measuring economic status using indicators, such as income, a dummy variable which indicates whether the household's home had a corrugated iron roof is identified to be used as a proxy indicator of economic status (Anderson et al., 2009). As it is an indicator of wealth, it is hypothesized that this variable affects being beneficiary of PSNP negatively.

Credit access: it is a dummy variable indicating whether the household had credit access or not. Those who had credit access can use it to purchase improved seeds or fertilizer so that they

would manage to escape the liquidity constraints experienced by many rural households in the study area. Moreover, the credit could also serve as a capital source to fund any non-farm activity that the farmers may undertake indicating that credit access minimizes the danger of being food unsecured. Hence the expected correlation between credit access and participation in PSNP is negative.

Total livestock holdings: it is a continuous variable that represents the aggregate livestock owned by a household which is measured in tropical livestock unit. Livestock size has a big role to play in ensuring the food security of the farmers this is because, in addition to contributing manure to improve the fertility status of the farm land livestock can be sold to generate income that would be spent to meet different needs which indicates the higher the amount of the livestock the lesser is the danger of being food unsecured. Therefore, those households with plenty of livestock holdings are less likely to benefit from the PSNP.

Access to Development Agent visit: it is a continuous variable that indicates the number of days per year a household has visited by government's development agent(s) in the last farming season. Farmers visited by these agents can improve their knowledge in using and managing their inputs compared to those without the service and this will in turn improve their productivity which minimizes the probability of being food insecure. Moreover, farmers with access to extension service are more likely to minimize mistakes associated with technology adoption compared to those without the service and this implies a positive impact of getting the service on farmers' productivity. Hence it is expected that getting enough service and participating in PSNP have an inverse relation.

Number of ox owned: There is a symbolic relationship between crop production and ox ownership in the mixed farming system. Oxen provide manure and draught power to crop cultivation therefore used to boost crop production (Abebaw, 2003). As a result, it is expected that the number of oxen owned and food insecurity (being PSNP beneficiary) to be negatively related in the study area.

Number of month: This is a continuous variable indicating the number of months in which the households have experienced a food gap prior to the introduction of the program. Since in most

cases facing food gap for a relatively longer period leads to receiving various aids, the expectation is a positive relation between numbers of months and being PSNP beneficiary.

3.4.1 Summary of explanatory variables

Table 2: variables included in the logit model

Variables	Description	Type
Dependent.V	1 if participate in PSNP, 0 if not	Dummy
Independent.v		
NAD	Number of male and female adults (15-64) in a HH	Continuous
AGHH	Age of the household (HH) head in years	Continuous
SHH	Sex of the HH head (1 if male,0 female)	Dummy
EDHH	Educational status of the HH head (in years of schooling)	Continuous
FASI	Family size, in number	Continuous
LASI (lagged)	Land size cultivated, in timad	Continuous
OFI (lagged)	Income from non-agricultural activities (1 if yes, 0 otherwise)	Dummy
ICR (lagged)	HH home has corrugated iron roof (1 if yes, 0 otherwise)	Dummy
CRA	HH has credit access (1 if yes, 0 otherwise)	Dummy
Oxow (lagged)	Oxen holding	Continuous
Noda	Number of days visited by Development Agent per year.	Continuous
No.month (lagged)	Number of month per year, food gap faced	Continuous
LIHD (lagged)	Livestock holdings in tropical livestock units	Continuous

Source: Own definition

3.5. Impact indicators

The impact indicators used in the study can be broadly grouped as asset holding and sustainable land management (SLM) practices.

3.5.1. Outcome variables for asset formation (accumulation)

The impact of the PSNP is analyzed by dividing the assets of the rural households in to3 categories. The first is the livestock asset that was measured in Tropical Livestock Unit (TLU). The second is the productive asset (which includes both the traditional and modern farm tools) and measured by the current market value of the asset based on the respondents' estimation in terms of birr. The last and the third category is the non-productive asset (which is the sum of household goods and consumer durables) this asset is also measured based on the estimation of its market value by respondents, in terms of birr.

3.5.2. Sustainable land management (SLM) outcome variables

According to the ministry of agriculture and rural development report (cited in Mohamed and John, 2005), the following sustainable land management practices are widely practiced in Ethiopia:

- Soil conservation measures (terracing, bund construction and tree planting).
- Structural measures (stone terraces, soil bunds and fanya juu).
- Cropping measures (crop rotation, intercropping and strip-cropping) and
- Fertility improvement practices (application of inorganic fertilizer, manure and compost).

As stated earlier, SLM practices are very wide and impossible to look into all of them, therefore, only a practice which are widely exercised in the study area are considered. Therefore SLM practices that are related with fertility improvement: application of chemical fertilizer (kg/ Timad) and manure (quintal/ Timad); and those related to soil conservation: stone and soil bunds both in meters/ Timad are the only impact indicators considered in the study.

Once the model has been developed there is a need to check whether or not some of the basic econometric assumptions have been violated. According to Gujirati (1992), there are different mechanisms that help us to identify the existence of multicollinearity problem and no single diagnostic tool that can give us a complete handle over the collinearity problem (Cited in, Abebaw, 2003). Gujarati establishes a rule of thumb, which says that multicollinearity is a serious problem, when a pair wise correlation coefficient between the two regressor is greater than or equal to 0.8 (Gujarati, 1998). The correlation matrix generated using our data shows that multicolliniarity is not a problem (See Annex-2). In most econometric data particularly in cross-sectional data, we are more likely to encounter heteroscedasticity problem. To correct these heteroscedasticity problem robust standard errors have been estimated.

Chapter Four

Results and Discussion

4.1. Descriptive Results

This section of the paper presents the descriptive result of the research finding as well as the summary of variables used in this study.

The population of the study area is highly dependents on agricultural activity as its main sources of livelihoods. The sex structure of the sample shows that, out of the total respondents 70 percent of them are male headed households and the remaining 30 percents are female headed households. The result also shows, the fact that from the total respondents 71 percent of the head of the households are illiterate or have zero level of education while, the remaining 29 percent of the respondents are with education with the maximum level of education is grade 7 and the minimum is grade 1.

4.1.1. Descriptive analysis of the dummy variables

Sex of the household head: From the total male headed household respondents, that have been included in the study, 59 percent are from the treated group while the other 41 percent are from the control group. In addition to the above result, out of the total female headed households, touched by the study, only 45 percent are PSNP participant and the remaining 55 percent of them are non-beneficiary households.

Iron corrugated roof: The result from table 3 shows, from the total respondent households who have iron corrugated roof only 44.7 percent are from the beneficiary household while from the total respondents who have no iron corrugated roof the majority, 66.3 percent, are from the beneficiary household. This is because at the time of selection, iron corrugated roof is used as a proxy to measure wealth status of the household.

Table 3: Analysis of dummy variables included in the study

	PSNP category				
	PSNP beneficiary			Non-PSNP beneficiary	
Variables	Sample size	Frequency	Percentage	Frequency	Percentage
Sex	Male(n=140	83	59	57	40.7
	Female(n=60	27	45	33	55
Credit access	Yes(n=105	55	52.4	50	47.6
	No(n=95	55	57.9	40	42.1
Nonfarm income	Yes(n=157	79	50.1	78	49.9
	No(n=43	31	72.09	12	27.89
Iron corrugated roof	Yes(n=105	47	44.7	58	55.3
	No(n=95	63	66.3	32	33.7

Source: Owen Computed from Household Survey data, 2013.

Credit access: as indicated in table 3, out of the total sample who took credit 52 percent of them are beneficiaries and the balance, non-beneficiaries.

Nonfarm income: Out of the total sample households without off-farm income, 72 percent of them are from the participant group and the remaining 28 percent are non participant households. Here the respondents are asked about their non-farm income before the introduction of the program. In the study area, most of the time the females are more likely to get off-farm income as compared to the male member of the same household. This is because; the off-farm income available in the study area is chat and groundnut trading which is totally left for women.

4.1.2. Descriptive analysis of the continuous variables

Age of the household head: the average age of the household head for the whole sample is around 49.5 years. When we compare the two groups in terms of their mean age, it was found that treated and controlled groups have average age of 49.09 years and 50 years respectively.

Education of the household head: consistent with our expectation, most of the household heads are almost illiterate , with mean educational status for the sample was found to be around 0.87, which indicates on average the household heads did not even completed grade one. Moreover, the result indicates that the mean education for the household heads benefiting from the PSNP is about 1.08 whereas for those household heads not participating in the PSNP their average education is obtained as 0.61. Statistically the mean difference in education between the household heads with and without the PSNP is found to be significant at five percent level.
Family size: As presented in table 4, the average family size of the combined sample is around 5.1. But when the data is disaggregated into participants and non participant households, the mean family size becomes 5.24 and 4.92 respectively. Moreover, on average, beneficiary Households have 2.05 male and 1.56 female active labors force while non-beneficiary households have 1.88 male and 1.94 female active labor forces. This result reveals that, households with a lower active female labor force were more likely to be selected as PSNP beneficiary as compared with those households with relatively higher number of active female labor force and it was found to be statistically significant at less than five percent level.

Table 4: Mean Comparisons of Continuous Variables Used in Logit Model

Variables	all sample	beneficiary	non- beneficiary	mean difference	t-value
Age	49.505	49.090	50.01	-0.92	0.78
Family size	5.1	5.245	4.922	0.32	1.006
Male-labor	1.98	2.054	1.88	.16	0.86
Fem-labor	1.732	1.563	1.944	-0.92	2.18**
Tlu	0.412	0.41	0.415	-0.005	0.096
Ox	0.02	0.18	0.22	-0.004	0.2
Land size	3.195	3.15	3.25	-0.1	0.608
No-month	3.37	3.427	3.3	0.127	1.48
Education	0.87	1.08	0.61	0.47	2.15**
No-DA visit	18.56	19.1	17.9	1.2	0.82

Source: Own Computed from Household Survey Data, 2013

** means significant at 5%

Number of days visited by DA per year: this represents the number of days in which a given household was visited by the government development agents (DA) during the last farming season. As indicated in table 4, the average number of visits for the whole sample was found to be 18.5 times a year; while the number of visits for beneficiaries and non-beneficiaries was found to be 19.1 and 17.9 times a year respectively.

Number of months per year faced food gap: on average, before the introduction of the program, the number of months in which the whole sample respondents experienced food gap is calculated to be around 3.37 months/year. Similarly, on average, the PSNP beneficiary households have experienced 3.4 months/year in which food gap has occurred while the non-

beneficiary households have experienced about 3.3months/year. The mean difference in the number of months between participant and non participant is found to be statistically insignificant (table 4).

Land size: As table 4 shows, the average land holding of the entire sample was about 3.19 timad. The average land size of the PSNP beneficiary households are around 3.15 while for those in the control group their average land size are around 3.25 timad. Statistically, there is no significant mean difference in land size between the participant and non- participant households.

Livestock holding: livestock is the one of main input in the traditional agricultural industry, which is largely practiced in Ethiopia in general and the study area in particular. In addition to serving as an input in agricultural activity livestock is one of the means to accumulate wealth. Once the data was collected from the entire sample about their livestock holding, Tropical Livestock Unit (TLU) was used to convert the various types of livestock in to a variable that has a uniform unit of measurement. Where 1 TLU is equivalent to 250kg (Anderson et al., 2009).

Before the introduction of the program, on average, the sample respondents have had 0.412 TLU. Moreover, the average TLU of the beneficiary households were around 0.41 whereas the average TLU of the non-beneficiary households were calculated to be about 0.415. This figure shows that both the beneficiary and non-beneficiary households are the poorest of the poor. Statistically, the mean difference in TLU between the beneficiary and non-beneficiary households was found to be insignificant.

In order to make a comparison, the current TLU of the respondents are also calculated. Currently, on average, the beneficiary households have about 0.95 TLU while the non-PSNP beneficiary households have around 0.29 TLU. This result implies that, on average, the TLU of the PSNP participating households has increased from 0.41 to 0.95 whereas the TLU of non-beneficiary households has diminished from 0.415 to 0.29. Statistically, the mean difference in current TLU between PSNP beneficiary and non beneficiary households is significant at one percent (table 6).

The result obtained above is highly supported by the findings of Shemeles (2009). According to the study conducted on the impact of PSNP on livestock, by Shimeles (2009), for the PSNP beneficiary households the average TLU has moved from 1.234 to1.755 showing an increment

while for those who are not included in the program the result shows a downward sliding feature in the size of TLU. He also indicated that, the mean difference of the two group i.e between beneficiary and non-beneficiary was statistically significant at less than 1 percent.

In addition to their TLU holding the respondent households are also asked about the number of oxen at their disposal. But in line with our expectation only a few households have had oxen during the time of selection in to the PSNP and this pushes down the average oxen holding of both beneficiary and non-beneficiary households. On average, the oxen of the treated households were 0.18 while for the non-treated households it was around 0.22. Statistically, the mean difference in oxen between the treated and control group was not significant.

4.1.3. Descriptive analysis of Agronomic practices and extra information

As part of the agronomic practice being practiced in the study area, the sample respondents are also asked about the number of various trees they have on their plots as well as the type of seeds they have used in the last farming season.

Accordingly, out of the total sampled households who have used improved seed (sorghum) in the last farming season 60.19 percent are from the beneficiary households whereas out of the total sampled respondents who have used local seed in the last farming season only 48 percent are from the beneficiary households. The implication of this result is, the PSNP beneficiary households are more active in using improved seeds as compared to their non-PSNP beneficiary counterparts. According to the information obtained from the study area, the only improved seed available to the farmer is sorghum and this improved seed is purchased by the farmers themselves irrespective of whether or not they are PSNP beneficiary households.

Table 5: mean comparison of tree holding

Variable name	Full sample	PSNP-households	Non-PSNP households	Mean difference	t-value
Mean-tree holdings	30.5	42	16	26	4.11***

Source: Own computed from households survey data, 2013

*** means significant at 1%

As far as the number of tree is concerned, on average the total sample respondent households have 30.5 various types of trees. To compare the number of trees in the two groups, on average the PSNP beneficiary households have 42 different kinds of tree while the non-PSNP beneficiary households have 16 various types of tree. Statistically, the mean difference in tree holding between the participant and non-participant households are found to be significant at 1 percent (Table 5). This result implies that, beneficiary households are more active in tree planting as compared to their counterparts and this is largely because of the participating households are scaling up the transplanting activity they carried out on the community land to their private land . This finding is highly backed by the findings of Anderson et al (2009), who have conducted a study on Impacts of the Productive Safety Net Program in Ethiopia on livestock and tree holdings of rural households using panel data. The result of their study proved the fact that participation in the PSNP has increased the number of trees planted by the beneficiary households. This result shows that tree planting, which is one of the main components of sustainable land management activity, is highly practiced by program beneficiary households as compared to the non beneficiary households.

Moreover, the changes in the housing condition of the beneficiary households are also assessed through examining the number of beneficiary households who have had corrugated iron roof house before selection and the number of beneficiary households who have corrugated iron roof house currently. Accordingly, before the introduction of the PSNP (at the time of selection) only 42.7 percent of the beneficiary households have had corrugated iron roof house whereas currently about 77.2 percent of the PSNP beneficiary households have corrugated iron roof house. The implication of the result is, the number of beneficiary households who have

corrugated iron roof house has increased from 47 households (42%) to 85 households (77%) over the intervention period of the program.

The PSNP beneficiary households are also asked about their preferences on the type of transfers they want to receive, i.e, weather their desire is to get the transfers in terms of cash, food or the mix. Accordingly, only 15 percent of the respondents prefer to receive their transfers in cash while about 19 percent of the PSNP beneficiary households want to receive their transfers in a mix, i.e, the combination of cash and food. But the majority of the PSNP beneficiary households prefer to receive their transfers in the form of food. The implication of this result is, as the study area is well known for its chat production any household can generate a certain amount of cash by supplying chat to the market and this cash may not be enough to purchase the necessary food from the market. And this shows that for the poorest of the poor in the study area, in relative terms, their sever problem is food shortage rather than cash shortage.

The beneficiary households are also asked about the nature of targeting in the study area in the time of selection, i.e, whether or not their family was fully targeted. Based o this only 30.9 percent of the PSNP beneficiary households was fully targeted while the remaining 69.1 percent of the PSNP beneficiary households have, at least, one member of their family excluded from the program. This indicates that, the PSNP beneficiary households were not fully included in the program. According to the information obtained this was due to the quota targeting systems; in the study area the maximum family size to be included in the PSNP was six. This indicates the fact that, had they fully targeted in the program the PSNP beneficiary households could have improved their welfare by far than their current welfare condition.

There was also a detail group discussion that involved the researcher, community leaders, woreda and kebele officials and the development agents. According to the obtained information, as compared to the non PSNP beneficiary households the program is pushing the PSNP beneficiary households up to get them out of the vicious circle of poverty. But still there is no sign of improvement concerning the dependency syndrome that has been planted by the program on the mind of the PSNP beneficiary households; the public-work PSNP beneficiary households still want to get the transfers for free without contributing in the public work activity.

Finally those involved in the group discussion have criticized the program for its failure to incorporate all the chronically food insured households in the study area. A lot of poor households did not targeted by the program and they still find themselves below their PSNP beneficiary counterparts.

4.1.4. Descriptive analysis of the impact indicators

Impact indicators related to asset holding: Here the livestock asset is measured in Tropical Livestock Unit (TLU) while the non-livestock assets are measured in birr, based on their current market value reflected by the respondents. According to table 6, the mean difference in asset between the beneficiary and non-beneficiary households is found to be positive and statistically significant at one percent. This implies that, the PSNP beneficiary households' posses' assets (both livestock and non-livestock) that have greater value (quality) as compared to the assets possessed by the non-PSNP beneficiary households.

Table 6: Mean comparisons for impact indicators under asset holding

Name of the assets	Full sample	PSNP-beneficiary	Non-PSNP beneficiary	Mean difference	P-value
Current TLU	0.6538	0.94	0.294	0.6527	0.0000***
Productive asset	422.25	624.13	175.5	448.63	0.0006***
Non-productive asset	880.12	1220.673	463.9	756.7727	0.000 ***

Source: Own computed from households survey data, 2013

Impact indicator related to sustainable land management: In the study area, both chemical and natural fertilizers were applied to enhance the status of soil fertility in last farming season. Table 7 shows that; on average, the application of chemical fertilizer by PSNP and non PSNP beneficiary households was around 15Kg and 10 Kg per timad, respectively in the last farming season. Similarly, the application of natural fertilizer (manure) in quintal per timad during the

specified year was 1.38 and 0.74 for the beneficiary and non-beneficiary households, respectively. The results show that, there was positive mean difference between PSNP participants and non participants in the application of both chemical and natural fertilizers during the same year. Statistically, this was found to be significant at one percent.

Table 7 also shows that, both PSNP participant and non participant households practiced soil bund than stone bund. The result reveals that there was a significant and positive mean difference between the two groups in terms of both stone and soil bund construction in meter per timad. On average, Productive safety net program participant households were better in practicing both soil and stone bund on their farm land than non participants. Statistically, this was found to be significant at one percent.

Table 7: Mean comparison of impact indicators under sustainable land management practices (SLM)

SLM practices	Type of SLM	beneficiary	Non-benefi	Mean difference	P-value
Fertility improvement practices	Chem.fert, kg/timad	15.6	10.6199	4.99	0.000 ***
	Manure, quintal/timad	1.38	0.7482	0.63	0.000 ***
Soil-conservation practices	Soil bund, meter/timad	23.53	9.53	14	0.000 ***
	Stone-bund meter/timad	9.96	6.89	3.07	0.006***

Source; Own computed from households' survey data, 2013

4.2. Econometric Results

To assess the impacts of PSNP on rural households' asset building and practicing sustainable land management activities the method of propensity score matching has been employed by the researcher. The estimation procedures entails, estimation of the propensity score which is the probability of each households participating in the program given their observable characteristics. The study employs the logistic model to calculate the propensity score on which the beneficiary and non-beneficiary households were matched. To calculate the propensity score through the logit model the dependent variable is a binary outcome that shows whether or not a particular household is beneficiary of the program, taking the value of 1 for the PSNP beneficiary households and 0 for the non-PSNP beneficiary households.

According to table 8, the estimated outcome of the logit model shows that; Prob > chi2 = 0.028 and pseudo R^2 value is found to be 0.1338 which is fairly low. According to Pradhan and Rawlings (2002), this low value of the pseudo R^2 reflects the fact that the allocation of PSNP was fairly random during the time of selection and there is no as such a big difference between the treated and non-treated group in terms of observable characteristics (cited in Tadele, 2011). Moreover, some of the variables used in the model are not influenced by the program while for those variables that are expected to be affected by the program the lagged value of the variables have been employed.

Determinants of PSNP participation: As depicted in table 8, at the time of selection, placement in to the program was significantly influenced by variables such as; sex of the household head, the family size of the household, the number of active female labor in the household, the number of months per year in which the household has experienced food gap, and households' housing condition (having corrugated iron roof house or not).

Table 8 also hinted that, male headed households have a higher probability of being PSNP beneficiary as compared to the female headed counterparts. Statistically, this is found to be significant at ten percent. Moreover, households with larger family size are more likely to participate in the program compared to those households with a relatively smaller family size this is because most of the time having large family size is associated with being food unsecured as resource is fixed in supply. Statistically this variable is found to be significant at five percent.

Similarly, during the time of selection, households with relatively higher active female labors have had a minimal chance of making in to the program as compared to the households with a relatively fewer active female labors. This is mainly due to in the study area; female active labors are likely to generate off-farm income by engaging in chat and groundnut trading which is totally left for women. In addition to this, ownership of corrugated iron roof house, which is a proxy to the wealth status of the household, gives a household a lesser chance of being PSNP beneficiary as compared to the households without the corrugated iron roof house. Statistically, both the number of active female labor and having corrugated iron roof house are found to be significant at one percent.

The number of months, per year, in which the households have experienced food gap, was also another factor that has had a significant role in determining the decision to select a particular household in to the program. Households that have experienced food gap for a higher number of months have had higher chance of being included in the PSNP as compared to those households that experienced the food gap for relatively lower months. Statistically, this is found to be significant at ten percent.

Note that: Dependent variable: whether or not the household participate in PSNP

Table 8: Logit Model Estimates for participation in PSNP

Variables	coefficients	Robust SEs	p-values
Household age	-.0093	.021	0.665
Household sex	.711	.383	0.063*
Household education	.167	.108	0.124
Family size	.271	.132	0.041**
No of male active labor	-.2217	.161	0.171
No of active female labor	-.506	.186	0.007***
No of months in which food shortage experienced	.461	.270	0.088*
Non- farm income	-.737	.452	0.104
Livestock holding (in TLU)	-.115	.414	0.781
Ox	.051	.786	0.948
Ownership of corrugated iron roof house	-.902	.320	0.005 ***
Land holding (in timad)	-.117	.151	0.439
No of days visited by Development Agent/year	.0097	.015	0.521
Access to credit	-.1011	.317	0.751
Constant	-.2069	1.43	0.885

Source: Own Computed from Household Survey Data, 2013

Summary statistics

Number of observations = 200

Pseudo R2 = 0.1338

Prob > chi2 = 0.0282

Log pseudolikelihood = -119.21731 Wald chi2(14) = 25.71

Testing the matching quality (effect analysis): as cited in Tadele (2011), despite the existence of different procedures available to check, whether or not the matching procedure has able to balance the distribution of different covariates between the treated and controlled unit, the basic aim of all of them is to compare before and after matching and if there still exists any difference after conditioning on propensity score. If the differences exist, there is an indication of incomplete (unsuccessful) matching and suggests remedial for actions (Caliendo and Kopeinig, 2005). Based on this the method of standardized bias (SB), equality of means using t-test, chi-square test for joint significance of the variables used and the value of Pseudo-R2 were utilized in this study.

According to appendix3, for the matched sample, except for the variable credit access the standardized bias for all variables are between 0 and 19% and this is below the critical level of 20% suggested by Rosenbaum and Rubin (1985) and the t-test shows that, after matching, the mean difference for all variables become insignificant. In addition to this, appendix3 also indicated that after matching the value of pseudo R2 is 0.041 and the likelihood ratio tests also becomes insignificant. Therefore all the results from appendix3 support the hypothesis that both groups have an identical distribution in the covariates after matching (Tadele, 2011), and it assures that one can evaluate the impact of PSNP as the participant and non-participants are very similar in their observable characteristics.

4.2.1. Impact of PSNP on Household Assets

In order to evaluate the impacts of the PSNP on rural households' assets, the study has attempted to examine it by classifying the households' assets in to different main categories; the categorical classification is needed because different assets have a distinct function to the rural households and due to this reason their value might not be the same. The assets are categorized in to: livestock holding (in TLU), productive asset and non-productive assets (both in birr). A positive value of ATT implies that, because of the program intervention household's assets have been protected in the study area.

4.2.1.1. Impact on livestock holding

After making detail enquires about the size of various livestock in the sampled households during the field survey, the various types of livestock has been converted in to the TLU so as to obtain a variable with identical unit of measurement. Since the livestock size is expected to be affected by the introduction of the PSNP, the sample respondents have been asked about their livestock size both before the commencement of the program (2006) and the current livestock size (2013). The current TLU was used as one of the impact indicator under the asset category whereas the TLU prior to the introduction of the program was used as a lagged explanatory variable in the logistic model.

The mean difference in TLU between the beneficiary and non-beneficiary households is found to be positive with the minimum and maximum value obtained as 0.63 and 0.67 respectively.

Statistically, the mean difference between the two groups is significant at one percent based on all of the matching estimators employed in this study, i.e, Stratification, NNM, Kernel and Radius matching. Therefore, all the matching estimators indicated that PSNP has brought a positive and significant impact on the livestock size of the beneficiary households.

The result from table 9 shows that, the program has helped the beneficiary households to have at maximum 0.67 (result of radius matching) more TLU and to the minimum 0.63 (result of NNM) more TLU as compared to the non-PSNP beneficiary households , but the two group was identical in their TLU size before the program has been commenced.

The positive and significant ATT found in this study shows the program is effective in protecting the livestock holding of the program participant in the study area. Gilligan et al (2008), who assessed the impact of Ethiopia's PSNP using the method of propensity score matching method based on various impact indicators, also found that the mean difference in livestock holding between PSNP and non-PSNP household is positive and significant at one percent.

4.2.1.2. Impact on Productive Asset

All households have been asked about the quantity as well as the current price of all the productive assets at their disposal, during the field survey. The result of this study shows that the

current value of productive asset at the hands of the PSNP beneficiary households is higher than the current value of productive assets at the hand of the non-PSNP beneficiary households.

The mean difference in the current value of productive asset between the PSNP beneficiary and non-beneficiary households is found to be positive and significant with the minimum and maximum ATT value calculated as 446 birr (based on NN matching) and 449 birr (based on the radius matching) respectively. Statistically, the calculated ATT for the treated and control group is found to be significant at one percent which is uniform to all the four matching estimators used in the study.

According to table 9, on average the productive asset of the beneficiary households' worth at maximum 448 birr (based on radius matching) and to the minimum 446 birr (based on NN matching) more as compared to the productive asset of the non- beneficiary households. In general, because of their participation in the program the beneficiary households have managed to protect their productive asset from possible deterioration. Thus, the program enables the PSNP beneficiary households to preserve their productive assets from depletion and this result is in line with the primary objective of the program, which is the protection of the rural households' asset from deterioration both in quality and quantity.

Gilligan et al (2008), who assessed the impact of Ethiopia's PSNP using the method of propensity score matching method based on various impact indicators, also found that the mean difference in farm tools (productive asset) between PSNP and non-PSNP households are positive and significant at one percent.

Moreover, a study by Devereux et al (2006) in support of the above finding indicated that, around 60 percent of PSNP beneficiary households managed to avoid losing of their productive assets so as to purchase food. Similarly, the result of the study shows that the program has helped participants to protect their assets from supplying to the market during the hardship season and almost one-quarter of the PSNP beneficiary households obtained new asset for their family.

4.2.1.3. Impact on Households non-Productive Assets

In this study household non-productive assets represent the sum of household goods like pot, oven etc and consumer durables like mobile phone, watch, tape and etc. After converting both

the household good and the consumer durable of the entire households in to their respective market value, the two categories have been added together to form the household non productive assets.

The impact of PSNP on household's non-productive asset is found to be positive with the maximum and the minimum ATT value calculated to be 783 birr (based on radius matching) and 759birr (based on NN matching) respectively. Statistically, this result is found to be significant at one percent for all matching estimators used in this study, i.e, based on Radius, Kernel, Stratification and NNM. The implication of this result is, because of the introduction of the program, the value of non-productive asset at the hands of the PSNP beneficiary households is higher than the value of the non-productive asset at the hands of the non-beneficiary households by the amount of at maximum 783 birr and at minimum 759 birr. And this result confirms the fact that the program is successful in avoiding the depletion in the non-productive asset of the beneficiary households. This result coincides with the finding of Yibrah (2010), who studied the impact of participating in the Productive Safety Net Program on Consumption and Asset holding. According to his finding, the program has a positive and significant impact both on the household goods (1%, level of significance) and durable goods (5% level of significance). He also stated that, PSNP beneficiary households possess more asset value than the non-participating households.

Generally, as compared to the non-PSNP beneficiary households the value of the asset possessed by the PSNP beneficiary households are higher and this shows that the beneficiary households are able to escape the danger of losing their assets in time of hardship. Moreover the study indicated that as a result of the program intervention the assets of the beneficiary households have been protected.

The finding of this paper, which indicated a positive and significant impact of the program both on the livestock and non-livestock asset, is in line with Hypotheses one of this study. The result obtained in this sub-section states that the PSNP beneficiary households have a higher amount of assets (livestock, productive and non-productive asset) and this finding proved the success of the hypotheses one.

Table 9: ATT estimation result of the impact of PSNP on household asset holdings

Outcome variables	Matching estimators	No. of PSNP beneficiary	No. of non-PSNP beneficiary	Average treatment effect on the treated(ATT)	t-statistics
Livestock holdings	Nearest neighbor	110	46	0.63	6.6***
	Stratification	110	81	0.63	8.2***
	Radius	110	81	0.68	8.3***
	Kernel	110	81	0.67	9.7***
Productive asset	Nearest neighbor	110	46	446.9	3.8***
	stratification	110	81	448.5	3.8***
	Radius	110	81	449.5	3.8***
	Kernel	110	81	447.8	3.7***
Non-productive asset	Nearest neighbor	110	46	759.6	6.6***
	stratification	110	81	763.9	6.8***
	Radius	110	81	783.5	6.9***
	Kernel	110	81	768.2	9.7***

Source: Owen computed from household survey data, 2013

*** Significant at one percent level

Overall, the finding obtained in this sub-section is identical to the study conducted by Shimeles (2009). According to Shimeles (2009), the mean asset values of the PSNP beneficiary households have increased from birr 4777 to birr 5887 whereas the mean asset value of the non-beneficiary households have diminished from birr 10,406 to birr 10,224. The result of Shimeles (2009) indicated that contrary to the non-beneficiary households, beneficiary households have registered an increment in their asset holding due to their participation in the program.

4.2.2. Impact of PSNP on Sustainable land management

Sustainable land management activity is the second impact indicator of the study. The main sustainable land management practices practiced in the study area is classified as fertility improvement activities and the soil conservation activity. The respondents, both from the participant and non-participants, were asked about their engagement in all of the above mentioned land management activities. The response from the households includes: the total amount of chemical fertilizer (both Dap and Urea and then converted in to kg/ Timad) as well as the total amount of manure (converted in to quintal/ Timad) used in their land in the last farming season. In addition to this, the households are also asked about the total length (converted in to meter/ Timad) of both soil and stone bunds they have constructed in their respective land. a positive value of the ATT shows that the program has a positive impact on the beneficiary households.

4.2.2.1. Impact of PSNP on Chemical Fertilizer Application

Application of Chemical fertilizer is one of the sustainable land management activities widely practiced in the study area. After separately collecting the data on the amount of Urea and Dap used in the last farming season, the researcher has combined the data by adding the amount of Dap and Urea used by each respondent in the last farming season to generate the amount of chemical fertilizer used in the last farming season.

The result of the study shows that the introduction of the program has a positive impact on the application of chemical fertilizer, with the maximum and minimum mean difference between the beneficiary and non-beneficiary households is calculated as 4.78 kg per Timad (based on NNM) and 5.3kg per Timd (based on stratification). Statistically, this positive impact of the PSNP on chemical fertilizer application is found to be significant at one percent for the entire matching estimators used in the study (radius, kernel, stratification and NNM).

According to table 10, on average the beneficiary households have applied to the maximum 5.3 (based on stratification) more kg of fertilizer and to the minimum 4.78 (based on NNM) more kg of chemical fertilizer per Timad in their respective land as compared to their non-beneficiary counterparts . The implication of this result is the program has brought the desired result as far as this indicator is concerned.

Previous studies in Ethiopia have shown that food for work programs (which had similar aim with PSNP except that PSNP focuses continuously on selected households over several years and it will eventually be phased out) had a positive impact on the probability of using chemical fertilizer (Sosina and Holden, 2007).

Generally, as a result of the program the PSNP beneficiary households are practicing the application of chemical fertilizer more than the non-beneficiary households. This implies that, the land under the beneficiary households are more managed compared to the land under the non-beneficiary households.

4.2.2.2. Impact of PSNP on Manure Application

The amount of manure in quintal per timad is another impact indicator chosen under the sustainable land management activity; in the study area farmers also use manure to improve the fertility of their land.

The result of the study indicates that the program has brought a positive impact on the application of manure in the study area, i.e, the mean difference between the households with and without the program is calculated to be positive and its maximum and minimum value is 0.74 quintal per Timad (kernel result) and 0.66 quintal per Timad (stratification result) respectively. Statistically, this is significant at one percent based on the whole matching estimators employed in the study.

The interpretation of the result obtained in table 10 is, on average the amount of manure the PSNP beneficiary households have applied is higher than the amount applied by the non beneficiary households by around 0.66 to 0.74 quintal per Timad in the last farming season. This result shows that participation in the program has enabled the beneficiary households to engage more in manure application in comparison with the households in the control group. The higher rate of manure application to the beneficiary group is may be resulted from the increase in their livestock holding.

4.2.2.3. Impact of PSNP on Stone Bund Construction

This particular impact indicator represents the length of stone bund in mater per Timad constructed by the households. The result of the study shows that on average, the PSNP beneficiary households have constructed more stone bunds in terms of meter per Timad as compared to the non-beneficiary households. The mean difference, in the length of stone bund, between the beneficiary and non-beneficiary households, ranges from 4.1 to 3.3 mater per Timad based on the result of NNM and radius matching respectively. The mean difference between PSNP and non-PSNP households is found to be positive and statistically significant at one percent for all matching estimators (table 10).

According to the result in table 10, the mean length of stone bund constructed by the beneficiary household is larger than the one constructed by the non-beneficiary households by around 4.1 to 3.3 meter per Timad. This result shows that participation in the program has helped the beneficiary households to build a relatively larger stone bund and this gives the participant households the advantage over the non participant households in managing their land in a sustainable manner.

4.2.2.4. Impact of PSNP on Soil Bund Construction

Soil bund is the other component of sustainable land management activity widely practiced in the study area. The result of this study revealed that, the estimated ATT value of the soil bund length in mater per Timad is positive and statistically significant, based on the four matching estimators used in this study, at one percent. According to table ten, the mean length of soil bund constructed by the PSNP beneficiary household is higher than the one constructed by the non beneficiary households with the mean difference ranging from 12.6 to 13.8 meter per timad. This result shows that, the program has enabled the beneficiary households to construct soil bunds with relatively more length as compared to the non-beneficiary households.

Overall, the result of the study indicated that Participation in the PSNP highly matters in explaining the level of engagement in practicing a sustainable land management activity.

In general, program participation leads to more involvement in the land management issue both from the fertility enhancement and soil conservation aspects. This is due to the fact that

participation in the program, especially the public work aspects of PSNP, improves the awareness of the participating households as they practice the soil and stone bund construction at the community land. The participant households also get relatively more advice from the Government Development Agents, during their interaction to construct both soil and stone bunds at the community land, about the manner and advantage of managing their land in a sustainable ways.

The second hypothesis of this study states that Productive Safety Net Program has a positive and significant impact on practicing sustainable land management activities, inline to this hypothesis the study shows that the gain due to participating in the program was positive and significant. In addition to this, the ATT result given in table 10 below is also supportive of the hypothesis. Generally, the land management of beneficiary households is better than the non-beneficiary households.

Table 10: ATT estimation results on the impact of PSNP on sustainable land management

Outcome variable	Matching estimators	No. of beneficiary	No. of non-beneficiary	ATT	t-value
Soil bund	NNM	110	46	12.677	6.41***
	Stratification	110	81	13.8	8.2***
	Radius	110	81	13.76	7.811***
	Kernel	110	81	13.3	7.5***
Stone bund	NNM	110	46	4.015	3.04***
	Stratification	110	81	3.31	3.1***
	Radius	110	81	3.3	2.9***
	Kernel	110	81	3.7	3.1***
Fertilizer	NNM	110	46	3.99	4.87***
	Stratification	110	81	5.3	6.7***
	Radius	110	81	5.2	6.2***
	Kernel	110	81	5.1	5.8***
Manure	NNM	110	46	0.73	5.5***
	Stratification	110	81	0.68	6.2***
	Radius	110	81	0.69	6.1***
	Kernel	110	81	0.74	9.3***

Source: Own computation from the field survey data, 2013

*** Significant at one percent level

Sensitivity analysis: According to (Tommaso Nannicini, undated) matching relies on the assumption of conditional independence of potential outcome and treatment assignment given observables, i.e., on the fact that selection into treatment is only driven by factors that the researcher can observe. This is the so called Conditional Independence Assumption (CIA), also known as “unconfoundedness” or “selection on observables” in the program evaluation literature. But, too many users implement matching without carefully examining whether the conditions for their application are met, or how robust the estimated ATT are with respect to

possible deviations from these conditions. This is because any unobservable factor affecting treatment leads to biased ATT. So as to tackle this problem, this study applied a Stata program (sensatt) that implements the sensitivity analysis for matching estimators proposed by Ichino, Mealli and Nannicini (2007).

The analysis in this sub-section is made based on the article of (Nannicini, undated), which presents the manual for the sensatt program. In order to simulate a dangerous or "killer" confounding factors one can search for the existence of a set of parameters pij such that if U were observed the estimated ATT would be driven to zero, if not the exercise would support the robustness of the estimates derived under the CIA. Here one may be worried that, by simply choosing the parameters pij, it is not possible to simulate a "dangerous" confounder, but as outlined by Ichino, Mealli and Nannicini (2007) by simply assuming p01 > p00 and by setting p1. > p0. One can simulate a confounding factor that has a positive effect on the potential outcome and treatment assignment respectively.

Based on the above reasoning the researcher has tried to conduct a sensitivity analysis which helped to claim that the estimated ATT is purely resulted from program participation. So as to test the robustness of the baseline ATT with respect to a confounder that is more "dangerous" the researcher has set the parameters Pij such that d > 0 and s > 0. As the sensatt result given in appendix5 shows even though, for some of the impact indicators, U is associated with a high selection and outcome effects, the simulated ATT is still very close to the baseline estimate. The fact that the simulated ATT (appendix5) is still close (not far away) to (from) the baseline ATT provided in table 9 and 10, one can conclude that the result of the sensitivity analysis is the confirmation of the research hypothesis which states participation in the PSNP makes the beneficiary households more active both in asset accumulation and sustainable land management issue. Therefore, it is concluded that the simulated ATT is the evidence for the robustness of the result provided in table 9 and 10. For example for livestock holding the baseline and simulated ATT is found to be 0.627 and 0.63 while for Manure application it is found to be 0.73 and 0.726 respectively. This result shows that the baseline ATT is insensitive to a potential confounder and there is no unobserved variable that contributed to the positive and significant ATT.

The psgraph also shows that the minimum requirements for the fulfillment of common support condition has been attained i.e, the probability of participation is between 0 and 1.

Chapter Five

Conclusion and Recommendations

5.1. Conclusion

The Ethiopian Government has launched the Productive Safety Net Program back in January 2005, to replace the previously existing and ineffective food for work program, with three distinct objectives: consumption smoothing, protection of the rural households' asset from depletion especially during hardship time and building community asset. The analysis was made based on the data collected from a total of 200 beneficiary and non beneficiary households found in rural kebeles of Haramaya district. A propensity score matching was employed in addition to the descriptive analysis to analyze the data obtained in field survey, and examine the impact of the PSNP on asset building and sustainable land management practices. Moreover, the logistic model was also used to examine the influential factors that governed the decision to select a given households into the program at the time of selection, back in 2006.

Based on the analyses presented in the previous chapter, the following conclusion has been drawn

In the descriptive analysis it was indicated that as a result of the program intervention the number of beneficiary households with corrugated iron roof house have increased from 42 to 85 households. This improvement in housing condition of beneficiary households is consistent with objective of the program, i.e, asset building. Moreover, the descriptive result also indicated that the mean various tree holding of the beneficiary households was found to be superior by about 26 trees as compared to the non-beneficiary households; and it was statistically significant at 1 percent. Tree planting is also another component of a sustainable land management activity under the agronomic practice.

In the logit model the factors that has been hypothesized to affect the selection decision was included. But as far as the study area is concerned, the selection decision was significantly influenced by: the gender of the household head, the number of months in which the household

experienced a food gap prior to the program implementation, housing condition before the program, the family size of the household and the number of active female labor.

The econometric result has indicated that due to the program intervention in the study area, the beneficiary households have a superior asset size than the non-beneficiary households. The mean difference in the current market value of the productive assets, between the beneficiary and non-beneficiary households, is found to be positive and statistically significant at one percent. This implies that because of the difference in the value of their asset their productivity level could also be affected. The program also has a positive and significant impact on the livestock holding as well as non-productive assets of the households. The non-productive and livestock assets of the beneficiary households is also very much higher than the assets of non-beneficiary households this is may be because the beneficiary households have replaced the income generated from selling their assets by the income they are earning from the transfers. Generally, in the study area the program is effective in attaining one of its main objectives which is the protection of the rural households' asset.

Similarly, the study also analyzed the impact of being PSNP beneficiary on practicing sustainable land management activities. The study revealed that the program has brought a positive and significant impact on a sustainable land management practices. On average the soil bund constructed by the beneficiary households is much larger than the one constructed by the non-beneficiary households and this is found to be significant at one percent. Apart from this, the findings of the study also indicated that the program has a positive and significant impact on the remaining components of sustainable land management which includes application of chemical fertilizer in kg per Timad, application of manure in quintal per Timad and stone bund construction in meter per Timad. This implies that due to the program intervention the beneficiary households are conserving their land in general and their soil in particular in a much better ways as compared to the non-beneficiary households.

In general, households participating in the program have able to prevent their assets from depletion and also managed their land and soil in a sustainable way as compared to the non-beneficiary households. The assets of the PSNP beneficiary households have been protected and there was statistically significant mean difference between the two groups.

5.2. Recommendations

The descriptive result indicated that the application of natural fertilizer (manure) in the study area is so low which is calculated to be around 1.3 and 0.7 quintal per Timad for the beneficiary and non-beneficiary households. The low level of livestock holding is the main reason for the low level of manure application in the study area; therefore the Government and all the concerned body should work to improve the livestock size in the study area like through delivering improved cows, goat and poultry for loan.

Despite the program having a positive and significant impact on both asset accumulation and land management, still there is no sign of improvement concerning the dependency syndrome that has been planted by the program on the mind of the PSNP beneficiary households; the public-work PSNP beneficiary households still want to get the transfers for free without contributing in the public work activity. To avoid this problem the development agents, who actually supervise the public work activity and deliver the transfers to the respective beneficiary households in the study area, should have to take a serious measures like blocking the benefit of households who do not contribute in the public work. Similarly program implementers should have to educate beneficiary households so that they could avoid their dependency feeling. This can be done by development agents (DA) who live in rural areas and provide agricultural extension services to farmers.

The empirical result of the study has indicated that, at the moment, the PSNP beneficiary households are much better than the non-beneficiary households both in terms of asset building and land management in a sustainable manner, therefore the Government has to make the necessary follow up even after graduation or else the beneficiary households may slide down in to their original poverty status once they graduated from the program.

Finally, the topic is still untouched at least at woreda and zonal level, so more researches should have to be under taken with regard to the various aspects of the program. Moreover, the impact of the program can be evaluated from various aspects apart from land management and asset building point of view.

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Appendices

Appendix 1: Conversion Factors Used to Estimate TLU

Livestock category	TLU	Livestock category	TLU
Ox	1.00	Donkey (young)	0.35
Cow	1.00	Sheep (adult)	0.13
Heifer	0.75	Sheep (young)	0.06
Bull	0.75	Goat (adult)	0.13
Calf	0.25	Goat (young)	0.06
Donkey (adult)	0.7	Poultry	0.013

Source: Storck, et al. (1991) adopted from Yibrah (2010)

Appendix 2: Correlation Coefficient between explanatory Variables

	part	hhage	hhsex	hhedu	fasi	mlabor	flabor	nomon	nfi	tlu	oxe	icroof
part	1.0000											
hhage	-0.0555	1.0000										
hhsex	0.1316	0.3259	1.0000									
hhedu	0.1514	-0.1536	-0.0550	1.0000								
fasi	0.0710	0.1700	0.4625	0.0608	1.0000							
mlabor	0.0616	0.2207	0.4551	0.0302	0.6211	1.0000						
flabor	-0.1534	0.1619	0.1334	-0.0364	0.5404	0.0301	1.0000					
nomon	0.1051	0.0892	-0.0326	0.0623	-0.0088	-0.1211	0.0915	1.0000				
nfi	-0.1798	0.1678	0.0027	-0.2171	-0.0091	0.0104	0.0651	0.0184	1.0000			
tlu	-0.0068	-0.0017	-0.0101	0.0046	-0.0771	0.0725	-0.1181	-0.0765	-0.1905	1.0000		
oxe	-0.0144	-0.0131	0.0156	-0.0803	-0.0536	-0.0513	-0.0272	-0.0284	0.0748	-0.1520	1.0000	
icroof	-0.2164	0.0595	0.0328	0.0495	0.0685	0.0382	0.0878	-0.0307	0.0384	0.0710	-0.0072	1.0000
lasi	-0.0432	0.1988	0.3808	-0.0349	0.5004	0.3594	0.3580	-0.0247	0.0463	-0.0631	-0.0397	0.1306
nodav	0.0585	-0.0226	0.1610	0.0680	0.1747	0.2616	-0.0013	-0.0825	-0.0929	0.0168	-0.0078	0.0571
crac	-0.0553	-0.0437	0.0109	-0.1511	-0.0022	0.0232	0.0229	-0.0474	-0.0104	-0.0207	-0.0787	0.0376

	lasi	nodav	crac
lasi	1.0000		
nodav	0.2557	1.0000	
crac	0.0784	0.0807	1.0000

Appendix3: Testing the balance of covariates after matching

Variable	Mean Treated	Mean Control	%bias	t-test t	t-test p>|t|
hhage	49.59	50.19	-7.3	-0.50	0.618
hhsex	.75238	.8	-10.4	-0.83	0.410
hhedu	.93333	.78095	10.1	0.77	0.443
fasi	5.2286	5.6095	-16.8	-1.29	0.197
mlabor	2.1048	2.3619	-19.3	-1.46	0.145
flabor	1.5905	1.6667	-6.2	-0.52	0.607
nomon	3.419	3.4571	-6.3	-0.47	0.639
nfi	.73333	.79048	-14.3	-0.97	0.333
tlu	.42436	.39933	6.6	0.50	0.620
oxe	.00952	.00952	0.0	-0.00	1.000
icroof	.42857	.4	5.8	0.42	0.676
lasi	3.1714	3.2476	-6.6	-0.53	0.599
nodav	19.21	17.257	19.2	1.37	0.173
crac	.51429	.38095	26.6	1.95	0.052

Summary of the distribution of |bias|

Percentiles		Smallest		
1%	0	0		
5%	0	5.840239		
10%	5.840239	6.215208	Obs	14
25%	6.284268	6.284268	Sum of Wgt.	14
50%	8.687291		Mean	11.10652
		Largest	Std. Dev.	7.186695
75%	16.83888	16.83888		
90%	19.26915	19.24663	Variance	51.64858
95%	26.61398	19.26915	Skewness	.6549552
99%	26.61398	26.61398	Kurtosis	2.670248

Pseudo R2	LR chi2	p>chi2	MeanB	MedB
0.041	12.04	0.603	11.1	8.7

Appendix4: STATA Program Output of the Estimation of Propensity Score for Matching

```
Logistic regression                                     Number of obs     =        200
                                                        LR chi2(14)       =      36.82
                                                        Prob > chi2       =     0.0008
Log likelihood = -119.21731                             Pseudo R2         =     0.1338
```

part	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
hhage	-.0093903	.0215255	-0.44	0.663	-.0515794	.0327988
hhsex	.7114962	.4230385	1.68	0.093	-.1176439	1.540636
hhedu	.1673112	.1154647	1.45	0.147	-.0589954	.3936178
fasi	.2717349	.1301905	2.09	0.037	.0165663	.5269035
mlabor	-.2217059	.1822841	-1.22	0.224	-.5789762	.1355644
flabor	-.50689	.1827995	-2.77	0.006	-.8651704	-.1486096
nomon	.4616227	.2654048	1.74	0.082	-.0585612	.9818066
nfi	-.7373737	.4196139	-1.76	0.079	-1.559802	.0850543
tlu	-.1153024	.4310649	-0.27	0.789	-.9601741	.7295693
oxe	.0513392	1.323777	0.04	0.969	-2.543216	2.645895
icroof	-.9021561	.3190638	-2.83	0.005	-1.52751	-.2768026
lasi	-.1171739	.1702169	-0.69	0.491	-.4507928	.216445
nodav	.0097132	.0167096	0.58	0.561	-.0230371	.0424635
crac	-.1011015	.3203568	-0.32	0.752	-.7289892	.5267863
_cons	-.206921	1.418117	-0.15	0.884	-2.98638	2.572538

```
Note: the common support option has been selected
The region of common support is [.19186132, .95627869]


Description of the estimated propensity score
in region of common support
```

Estimated propensity score

Percentiles	Smallest		
1% .1939861	.1918613		
5% .2483797	.1939861		
10% .3057771	.1960019	Obs	191
25% .4086708	.2093645	Sum of Wgt.	191
50% .5645407		Mean	.5680638
	Largest	Std. Dev.	.1934795
75% .7153848	.9133279		
90% .8239523	.9260975	Variance	.0374343
95% .8639833	.9279779	Skewness	-.0461531
99% .9279779	.9562787	Kurtosis	2.00833

```
**************************************************
Step 1: Identification of the optimal number of blocks
Use option detail if you want more detailed output
**************************************************

The final number of blocks is 5

This number of blocks ensures that the mean propensity score
is not different for treated and controls in each blocks


**********************************************************
Step 2: Test of balancing property of the propensity score
Use option detail if you want more detailed output
**********************************************************

The balancing property is satisfied

This table shows the inferior bound, the number of treated
and the number of controls for each block
```

Inferior of block of pscore	participation in PSNP nonpartic	participa	Total
.1918613	2	1	3
.2	32	12	44
.4	25	35	60
.6	15	37	52
.8	7	25	32
Total	81	110	191

```
Note: the common support option has been selected
```

Appendix5: Results of sensitivity analysis

- ✓ Sensatt Soil bund part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.7) p10(.7) p01(.3) p00(.1) se(bse) comsup boot reps(100) logit

ATT estimation with simulated confounder

Between-imputation standard errors

ATT Std. Err. Out. Eff. Sel. Eff.

12.264 2.484 192.210 24.949

Note: Both the outcome and the selection effect are odds ratios from logit estimations.

- ✓ Sensatt Soil bund part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.8) p10(.8) p01(.6) p00(.3) se(bse) comsup boot reps(100) logit

ATT estimation with simulated confounder

Between-imputation standard errors

ATT Std. Err. Out. Eff. Sel. Eff.

12.497 1.499 550.333 10.043

Note: Both the outcome and the selection effect are odds ratios from logit estimations.

- ✓ Sensatt Stone bund part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.8) p10(.8) p01(.5) p00(.4)se(bse) comsup boot r(100) logit

ATT estimation with simulated confounder

Between-imputation standard errors

ATT	Std. Err.	Out. Eff.	Sel. Eff.
3.638	0.985	2.464	7.028

Note: Both the outcome and the selection effect

are odds ratios from logit estimations.

- ✓ Sensatt Stone bund part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.8) p10(.8) p01(.6) p00(.4)se(bse) comsup boot r(100) logit

ATT estimation with simulated confounder

Between-imputation standard errors

ATT	Std. Err.	Out. Eff.	Sel. Eff.
3.537	0.933	3.869	5.799

Note: Both the outcome and the selection effect

are odds ratios from logit estimations.

- ✓ Sensatt Fertilizer part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.8) p10(. 7) p01(.4) p00(.2)se(bse) comsup boot r(100) logit

ATT estimation with simulated confounder

Between-imputation standard errors

ATT	Std. Err.	Out. Eff.	Sel. Eff.
4.377	1.073	1.40e+09	14.694

Note: Both the outcome and the selection effect

are odds ratios from logit estimations.

- ✓ Sensatt Fertilizer part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.8) p10(. 8) p01(.6) p00(.3)se(bse) comsup boot r(100) logit

ATT estimation with simulated confounder

Between-imputation standard errors

ATT	Std. Err.	Out. Eff.	Sel. Eff.
4.589	0.981	2.04e+15	9.270

Note: Both the outcome and the selection effect are odds ratios from logit estimations.

- ✓ Sensatt Manure part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.8) p10(. 8) p01(.6) p00(.3)se(bse) comsup boot r(100) logit

ATT estimation with simulated confounder

Between-imputation standard errors

ATT Std. Err. Out. Eff. Sel. Eff.

0.730 0.083 1.08e+10 11.698

Note: Both the outcome and the selection effect

are odds ratios from logit estimations.

- ✓ Sensatt Manure part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.8) p10(. 8) p01(.6) p00(.2)se(bse) comsup boot r(100) logit

ATT estimation with simulated confounder

Between-imputation standard errors

ATT Std. Err. Out. Eff. Sel. Eff.

0.726 0.105 1.36e+27 17.345

Note: Both the outcome and the selection effect are odds ratios from logit estimations.

- ✓ Sensatt TLU-current part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.8) p10(.8) p01(.6) p00(.3) se(bse)comsup boot reps(100) logit

ATT estimation with simulated confounder

Between-imputation standard errors

ATT	Std. Err.	Out. Eff.	Sel. Eff.
0.627	0.065	73.065	10.715

Note: Both the outcome and the selection effect are odds ratios from logit estimations.

- ✓ Sensatt TLU-current part hhage hhsex hhedu fasi mlabor flabor nomon nfi tlu oxe icroof lasi nodav crac, p11(.8) p10(.7) p01(.3) p00(.1) se(bse)comsup boot reps(100) logit

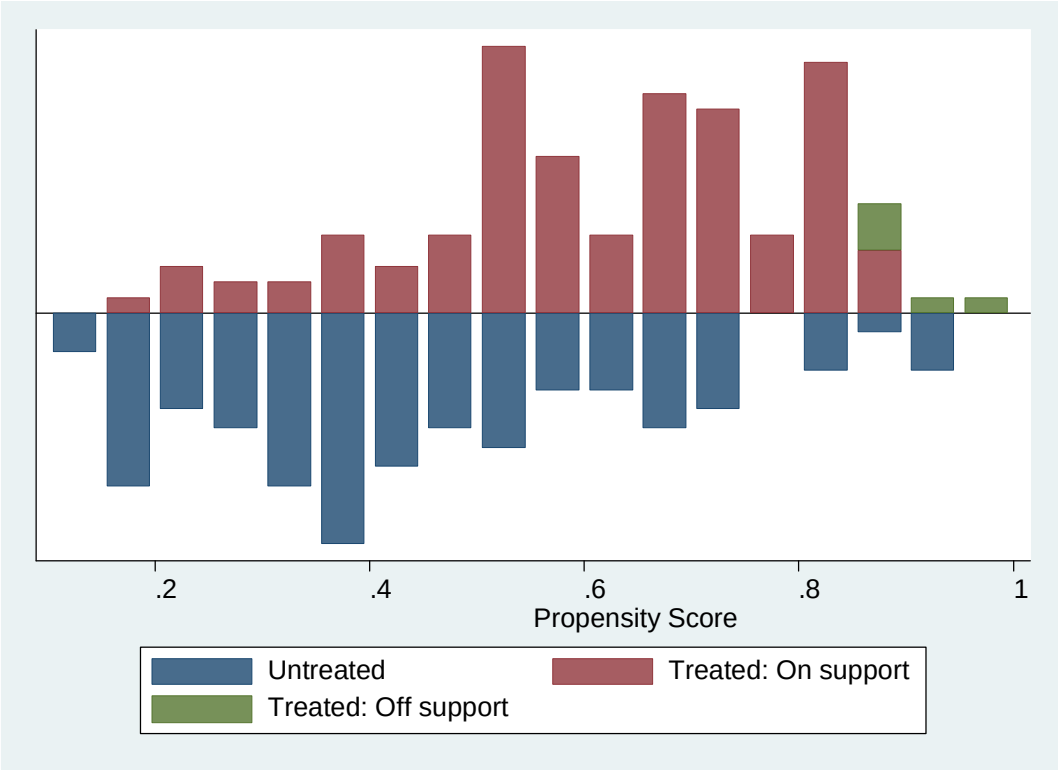
ATT estimation with simulated confounder

Between-imputation standard errors

ATT	Std. Err.	Out. Eff.	Sel. Eff.
0.601	0.138	262.770	38.317

Note: Both the outcome and the selection effect are odds ratios from logit estimations.

Appendix 6: psgraph



Appendix 7: Questionnaire used for survey, 2013

Module 1: Demographic background of the household

Note: first head of hh, spouse, children then others

ID code	1.Household members list	2.Relation to the household head	3. Age (in years)	4.Sex	5.Marital status	6.Educ (in years)	7.Occupation

Code:

Sex; 1 = male, 0 = female

Occupation; 0= student, 1= farmer, 2= disabled, 3= trader, 4= other

R/n to household's head; 1 = wife, 2 = son, 3 = daughter, 4 = relative, 5 = other

Marital status; 0= single, 1=married, 2= divorced, 3= widowed, 4= separated,

Module 2. Household assets- Land and type of house ownership

I .Owned land

A. Please tell us about the land you or your household own, exclude any sharecropped in or rented land but include the sharecropped out or rented to others.

Plot No	**1.**plot size, in timad	**2.** When did you get it? The year	**3**. Do you have land certificate? 1= yes, 0= no	4.Distance from home(in minutes of walk)

B. This section is applicable only for the household that has irrigable land.

Plot No	5.plot size, in timad	6. When did you get it? The year	7. Do you have land certificate? 1=yes, 0= no	8.Distance from home(in minutes of walk)

1. Did you sharecropped in and/or sharecropped out land in the last farming season?

1= yes, 0= n

2. If you say yes to the above question:

Sharecropped out……..in timad sharecropped in…….in timad

3. Did you have iron corrugated roof house before the introduction of the program?

1 = yes, 0 = no

4. Do you have iron corrugated roof house currently?

1 = yes, 0 = no

5. If you say no to the above question, specify the types of your house's roof?

ii. Assets of the household

How many of the following assets do your household own? (Write 0 if none). For livestock, include any animal that belong to you, but are being raised by other households but exclude any animals that you are rearing for someone else that don't belong to you.

Livestock assets	Total amount owned before program	Unit price	Total price	Total amount currently	Unit price	Total price	If any difference why?
Livestock types							
Oxen							
Local cows							
Improved cows							
Heifer							
Bull?							
Calf							
Sheep							
Sheep (young)							
Goat (adult)							
Goat (young)							
Mule (adult)							
Mule (young)							
Horse (adult)							
Horse (young)							
Donkey (adult)							
Donkey (young)							
Camel (young)							
Camel (adult)							
Poultry							
Bee-colony							
Subtotal							

Codes: Differences in asset ownership

1 = We were forced to sell the asset to buy food
2 = We were forced to exchange the asset for food
3 = We were forced to sell the asset to pay for health expenses

4 = We were forced to sell the asset to pay for education expenses
5 = We had to sell the asset to meet social obligations (e.g. wedding)
6 = We used the asset in a social occasion (e.g. wedding gift))
7 = We sold the asset for another reason (specify): _____
8 = The asset was stolen
9 = Livestock died
10 = Livestock was slaughtered for food
11 = Livestock reproduced
12 = We bought this asset
13 = Someone gave us this asset for free
14 = Other (specify): _____

Non livestock assets	**Total quantity owned currently**	**Unit price**	**Total price**
Productive asset			
Plough			
Sickle (traditional)			
Sickle (modern)			
Pick axe			
Axe			
Hoe			
Spade/shovel			
Traditional Bee Hive			
Modern Bee Hive			
Water pump			
Drip Irrigation			
Water pump (diesel)			
Grain mill (diesel)			
Grain mill (stone)			
Other (specify)			
Subtotal			

Consumer durables			
Jewelers (gold, silver etc)			
Watch			
Mobile phone			
Tape recorder/Radio			
Other items			
Subtotal			
Household goods			
Animal cart			
Wheel Barrow			
Chair, bench etc			
Table and similar items			
Box, cupboard, shelf etc			
Bed (wood or metal) sire			
Sofa			
Plastic buckets, cups etc			
Glasses			
Pot			
Metal pots			
Metal			
Oven and/or gas			
Broom			
Subtotal			

Module 3. Food security, shocks and income type

1. Did your household experienced food gap to satisfy its food demand prior to the introduction of the program?

1= yes, 0= no

2. If you say yes to question no 1 above, in which month did your household face the food shortage (point all that apply)?

Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug

3. Did you or your household face food gap in the last farming year?

1= yes, 0= no

4. Did you or your household face any shocks in the last 7 year?

1= yes, 0= no

5. If you say yes to the above question no 8, circle all you or your household experienced for the last 7 years?

Weather related shocks; drought, flood, erosion	1= yes, 0= no	
Shocks like: pests, disease, crop loss or theft	1= yes, 0= no	
Shocks due to death or illness of person	1= yes, 0= no	

6 . Did you or any other member of your household engaged in any non-farm income generating Activities, before the introduction of the program?

1 = yes, 0 = no

Module4. Investment on sustainable land management practices and Farming

A. Investment on SLM practices

1. What was the total amount of chemical fertilizer (in kg) that you used to fertilize your plot(s) in the last farming season? DAP…….. Urea……..

2. What was the total amount of manure (in quintal) that you used to improve the fertility of your plot (s) in the last farming season?

3. What was the total amount of compost (in quintal) that you used to improve the fertility of your plot (s) in the last farming season?

4. Please tell us about the total length of; soil bunds (m) …….. Stone bunds (m)……..

B. Farming

Plot ID			
Major crop last season: name and yield in quintal			
Minor crop1 last season: name and yield in quintal			
Minor crop 2 last season: name and yield in quintal			
Minor crop n last season: name and yield in quintal			
Seed type (1= improved, 0= local)			
Number of trees planted on all of your plots , in number			
Tree 1			
Tree 2			
Tree n			

Module5. Infrastructure and services

1. Tell us about the distance from your home to the following center of service or infrastructure:

S.N	Infrastructure and service	Distance, in minutes of walk
	Credit institution/bank	
	Feeder road	
	Seasonal road	
	All weather road	
	Nearest market	

O

	Irrigation system	
	Extension agent office	
	Veterinary service center	

2. Are you beneficiary of the ongoing family based agricultural extension package program?

1= yes, 0= no

3. If you say yes to question no 2 above, what are the types of package that your household has obtained (indicate all related to you)?

Types of package	1= yes	0= no	Types of package	1= yes	0= no
A. Livestock package			3.Roof water harvesting		
1.Dairy production			B. Crop package		
2.Sheep and Goat			1.Chemical fertilizer		
3.poultry			2.Irrigation		
4.Bee hives			3.Improved seeds		
5.Fattening			4.Pesticides/Herbicides		
B. Household based water harvesting					
1.Pond					
2.Hand dug well					

4. Did your household visited by government's development agent (DA) before the program has been implemented?

1= yes, 0= no

5. Did your household visited by government's development agent (DA), in the last farming season?

1= yes, 0= no

6. If you say yes to the above question no 5, how many times you were visited by the DA last season?

7. If you say yes to question no 5 above, what was the main services that you received?

8. Did you take credit in the last 7 years? 1 = yes, 0 = no

9. If yes what was your main sources of credit?

A= Relatives B= Cooperatives C= commercial banks D= Microfinance

E= Traditional lenders F= Specify any unmentioned sources

10. What was the credit used for?

A= to purchase chemical fertilizer B= to transport manure and compost from home to farming place C= to buy different farm tools D= Livestock purchase

E= to construct dams F= any other (specify)

Module6: Targeting

A. PSNP Beneficiary household

1. What do you think was the reason for the selection of your household to benefit from PSNP? (Use all that apply).

Circle all that apply	Reason for selection	Circle all that apply	Reason for selection
	Our household is poor		We haven't received other gov't assistance (like food aid)
	We have no labor		Our household is participating in OFSP
	We can't get enough food to eat		We were included after complaining our exclusion
	We are landless		We have received food aid/emergency cash transfer in previous years
	We have poor quality of land		We haven't family support or

			remittance from relatives
	The household head is female		Members of our household are disabled /mentally challenged
	We have a small landholding		We own no, or only few livestock
	Household members are sick		We have no source of off-farm income
	We don't know		

2. Who selected which household would receive the transfer from PSNP?

1. The D.A
2. Kebele Food security task force
3. Kebele administration
4. The community
5. Woreda Food security task force
6 Woreda administration
7. I don't know
8. Other (specify)……..

3. Do you think the selection is fair?

1= yes, 0= no

4. Are there any members of your household excluded from being beneficiary of PSNP?

1= yes, 0= no

5. If you say yes to the above question, why they are excluded?

6. If you could choose, would you prefer to get the benefit from PSNP in terms of cash, food or mix? Circle only one

0= cash, 1= food, 2= mix

Use of PSNP cash/food or mix received

7. What did you do with all the cash/food you received in the last 12 months? (Use all that apply).

Consumption items	1= yes, 0= no	Investment items	1= yes, 0= no
Paid tax		Bought animal feed	
Lent some to others		Bought livestock	
Gave for free some to others		Debt repayment	
Bought cloth		Bought seeds for farming	
Bought groceries(salt, sugar etc		Bought fertilizer	
Bought other type food (meat		Used to start business	
Social obligation (specify……)		Paid for educational fee	
		Paid for health cost	

B. Non beneficiary household

1. Why was your household not selected as PSNP beneficiary? (Use all that apply).

Circle all that apply	Reasons	Circle all that apply	Reasons
	Our household is not so poor		We are not landless
	Our household is not willing to work on the PSNP		Our household is not participating in OFSP
	We have enough food to eat		Due to the quota system
	We have some better quality land		We haven't received food aid/emergency cash transfer in previous years
	We don't have friends or relatives among the decision makers		We haven family support or remittance from relatives
	The household is not registered in the kebele household list		Members of our household are not able to work on PSNP
	We have other sources of income		We own livestock
			Any other……
	We don't know		

2. Who selected which household would receive the transfer from PSNP?

1. The D.A
2. Kebele Food security task force
3. Kebele administration
4. The community
5. Woreda Food security task force
6 Woreda administration
7. I don't know
8. Other (specify)……..

3. Do you think the selection is fair?

1= yes, 0= no

4. If no, did you complain? 1= yes, 0= no

5. If yes, to whom did you complain? If no why?

Circle all that apply	**complained to**	**Circle all that apply**	**Why not?**
1	Kebele authorities	1	There is no-one to complain to
2	Woreda authorities	2	We don't know who to complain to
3	Zonal authorities	3	It would not do any good to complain
4	Regional authorities	4	I am too frightened to complain
5	Community meeting	5	The decision-makers are the same people who hear the appeals
6	Rapid response team	6	Other reason (specify):
7	Any other		